Engaging in CULTURALLY RELEVANT MATH TASKS

FOSTERING HOPE in the ELEMENTARY CLASSROOM

Lou Edward Matthews • Shelly M. Jones • Yolanda A. Parker

CORWIN Mathematics

WHAT YOUR COLLEAGUES ARE SAYING . . .

"Since the emergence of Culturally Relevant Pedagogy as a pedagogical theory, teachers have been asking, 'Yes, but how do we do it?' *Engaging in Culturally Relevant Math Tasks* is the volume we need to answer that question. It belongs on every teacher's bookshelf."

Gloria Ladson-Billings
Professor Emerita, FBA
Immediate Past President, National Academy of Education
Fellow, The British Academy
Fellow, American Academy of Arts & Sciences
Fellow, American Educational Research Association
Madison, WI

"*Engaging in Culturally Relevant Math Tasks* is brilliant, bold, and absolutely beautiful! The authors remind us that equity and excellence draw on the brilliance of the students and communities we serve, and on the mathematics already present in students' racial and cultural identities, communities, and history. The concepts and ideas shared here are a game-change in mathematics education! Both practical and inspirational, this book offers the perfect blueprint with in-the-moment guidance and practical classroom tools to make culturally responsive instruction attainable."

Cathery Yeh
Assistant Professor, Attallah College of Educational Studies
Program Co-Director, Ethnic Studies Interdisciplinary Minor and Cluster
Director, Community Math Learning Center
Chapman University, CA

"*Engaging in Culturally Relevant Math Tasks* provides the rationale, practices, task design tools, and beautiful examples to learn how to engage children in culturally relevant math tasks. It is the first book that connects culturally relevant teaching and mathematics in an authentic way to help math educators, coaches, and leaders bring out the brilliance in *all* of their students!"

Georgina Rivera
NCSM Second Vice President
West Hartford, CT

"*Engaging in Culturally Relevant Math Tasks* is a foundational resource for any educator seeking to engage their students in a culturally relevant math experience. In this resource educators will find practical tools, tips, and strategies that can be implemented immediately within their educational environment."

Kristopher J. Childs
Chief Equity and Social Justice Officer
Open-Up Resources
Winter Garden, FL

"*Engaging in Culturally Relevant Math Tasks* is a powerful, practical resource for teachers whereever they might be on their teaching journey. It offers insightful guidance in developing and implementing CRMTasks that give students voice, empowers students, connects mathematics to family and community, and provides an approach where students see themselves in the mathematics—all while pushing mathematical complexity, relevance, and high expectations for all students. I found the focus on intentionality energizing in supporting students as they understand and critique their world. Thank you to the authors for sharing your vision and experience!"

Trena Wilkerson
Professor, Baylor University
National Council of Teachers of Mathematics,
President, 2020–2022
Waco, TX

"*Engaging in Culturally Relevant Mathematics Tasks* is a much-needed book for socially and culturally conscious teachers of mathematics. Drawing inspiration from the tasks will give teachers the opportunity to engage their elementary learners in becoming critical mathematical thinkers of the world around them. The treasures found in this book should be highly cherished by all."

Michelle D. McKnight
K–5 Mathematics Instructional Coach
South Windsor Publics Schools
South Windsor, CT

Engaging in Culturally Relevant Math Tasks

This page is intentionally left blank

Engaging in Culturally Relevant Math Tasks

Fostering Hope in the Elementary Classroom

Lou Edward Matthews

Shelly M. Jones

Yolanda A. Parker

CORWIN Mathematics

CORWIN
A SAGE Publishing Company

For information:

Corwin
A SAGE Company
2455 Teller Road
Thousand Oaks, California 91320
(800) 233–9936
www.corwin.com

SAGE Publications Ltd.
1 Oliver's Yard
55 City Road
London, EC1Y 1SP
United Kingdom

SAGE Publications India Pvt. Ltd.
B 1/I 1 Mohan Cooperative
Industrial Area
Mathura Road, New Delhi 110 044
India

SAGE Publications Asia-Pacific Pte. Ltd.
18 Cross Street #10–10/11/12
China Square Central
Singapore 048423

President: Mike Soules
Vice President and Editorial Director: Monica Eckman
Publisher: Erin Null
Development Editor: Amy Reed
Content Development Editor: Jessica Vidal
Editorial Assistant: Nyle De Leon
Production Editor: Tori Mirsadjadi
Copy Editor: QuADS Prepress Pvt. Ltd.
Typesetter: Integra
Proofreader: Talia Greenberg
Indexer: Integra
Cover Designer: Gail Buschman
Marketing Manager: Margaret O'Connor

Printed in the United States of America.

Library of Congress Cataloging-in-Publication Data

Names: Matthews, Lou Edward, author. | Jones, Shelly M., 1964- author. | Parker, Yolanda A., author.
Title: Engaging in culturally relevant math tasks : fostering hope in the elementary classroom / Lou Edward Matthews, Shelly M. Jones, Yolanda A. Parker.
Description: Thousand Oaks, California : Corwin, [2022] | Includes bibliographical references and index.
Identifiers: LCCN 2021057534 (print) | LCCN 2021057535 (ebook) | ISBN 9781071841716 (paperback) | ISBN 9781071841693 (epub) | ISBN 9781071841686 (epub) | ISBN 9781071841662 (adobe pdf)
Subjects: LCSH: Mathematics--Study and teaching (Elementary)--Social aspects. | Culturally relevant pedagogy.
Classification: LCC QA135.6 .M38823 2022 (print) | LCC QA135.6 (ebook) | DDC 372.7/044--dc23/eng/20220125
LC record available at https://lccn.loc.gov/2021057534
LC ebook record available at https://lccn.loc.gov/2021057535

This book is printed on acid-free paper.

22 23 24 25 26 10 9 8 7 6 5 4 3 2 1

Contents

To access online resources for this book, visit the *Engaging With Culturally Relevant Math Tasks (Elementary)* Free Resources tab on the Corwin website or visit **https://bit.ly/3Lgv22E.**

Preface

> *Well, I'm finding it difficult to connect to their prior culture thing, because I'm following from . . . what the textbook [says] at the moment. . . . [I] try and get a handle on it and it doesn't seem. . . . I'm having trouble finding things that I would like to connect [to] culture with them.*
>
> *—Denise, an elementary teacher*

That was part of a conversation from more than 20 years ago, with one of the very first elementary teachers we worked with in our journey to help new teachers reinvent mathematics teaching. Denise met one of the authors during a summer workshop on culturally relevant teaching in 2001. She was an early career teacher eager to find new, engaging ways to teach mathematics, but was finding it difficult to navigate the challenges of her text, curriculum, and even her own knowledge about student culture and community. We were doctoral students then, studying mathematics teaching and learning in Illinois, having spent several years in the classroom.

Years later, we have encountered many Denises on our journey. We wanted to write a book to help fundamentally shift the way elementary teachers like Denise create experiences of hope and engagement in mathematics. Every day, everywhere, teachers plan and design mathematics lessons based on the curriculum they have, their knowledge of students, and, of course, their own experiences. We see important opportunities in every mathematics classroom to shape how children experience mathematics and the world around them.

As authors, our experiences run the span of K–12 and teacher education, in the United States, Caribbean, South America, and Africa. Together, the three of us bring a combined experience of more than 75 years as classroom teachers, teacher preparation leaders, teacher leaders, researchers, and system leaders. In this book, we aim to open up our practice and share our insight so that you and your students may reimagine mathematics, the world, your communities, and yourselves in these experiences.

WHAT THIS BOOK IS ABOUT

Among the things that influence students' learning experiences are the quality of mathematics tasks in which they engage, the discourse those tasks support, and the interactions they foster. Culturally relevant mathematics engages and empowers students, helping them make connections to themselves, their communities, and the world around them. We believe

that planning and implementing culturally relevant mathematical tasks provide one of the greatest opportunities to inspire and influence student learning in mathematics.

> Culturally relevant mathematics *engages and empowers students, helping them make connections to themselves, their communities, and the world around them.*

This book is designed as a primary resource for educators engaging in mathematics task adoption, design, planning, and implementation in ways that have potential to engage, inspire, and empower K–5 children. Our goal is to offer a practical and inspirational approach to culturally relevant mathematics instruction in the form of intensive, in-the-moment guidance and practical classroom tools to meet teachers where they are and help grow their practice day by day. We focus on research-based and learner-centered teaching practices to help students develop deep conceptual understanding, procedural knowledge and fluency, and application in all mathematical content in grades K–5.

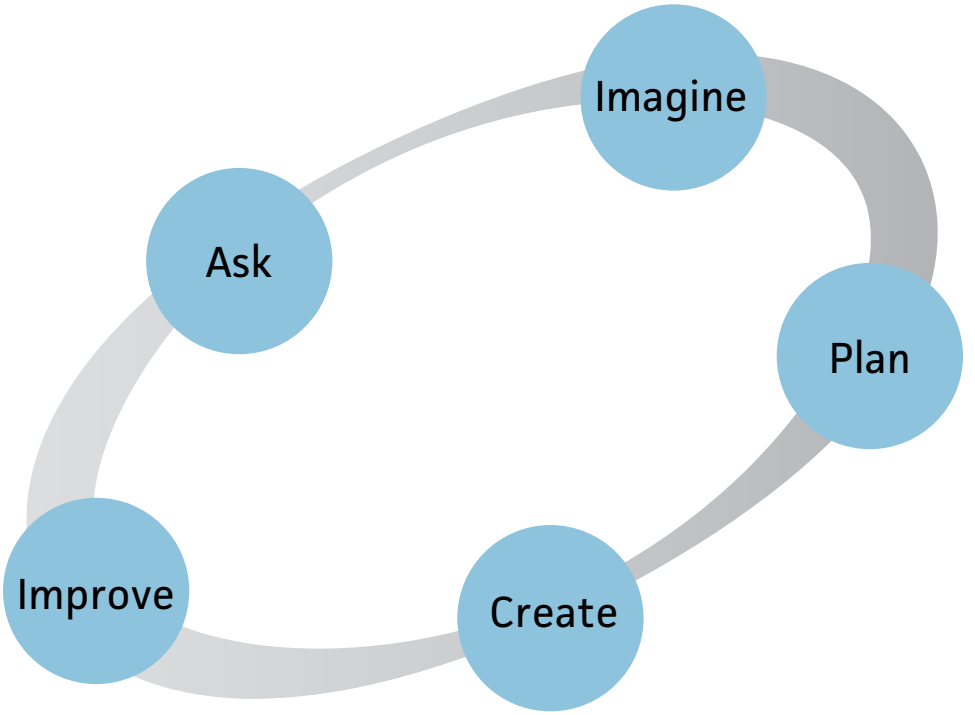
WHO THIS BOOK IS FOR

This book is designed for the professional development of elementary teachers—both those who are established and those early in their career. It's also designed for mathematics teacher educators, mathematics teacher leaders and mentors, coaches and instructors in clinical residency programs, curriculum designers, principals, and consultants who teach and design professional learning experiences in K–5 mathematics. Those teaching and learning in teacher preparation programs will see this as a useful anchor text in mathematics methods and pedagogy coursework. This book will be especially beneficial for teachers whose students are culturally different from them and who want to teach mathematics in more authentic, inclusive, and meaningful ways.

HOW THIS BOOK WORKS

We see teachers as *engineers* who can design and refine engaging and inspiring mathematics learning experiences driven by the kind of high-quality and culturally relevant mathematics tasks that will empower and engage students. We have written this to be interactive and applicable, providing practice-guided knowledge that preservice, novice, and veteran teachers can use to shape culturally relevant experiences for all students while systematically building lessons that are standards based. We utilized the following elements of the engineering design process—*Ask*, *Imagine*, *Plan*, *Create*, and *Improve*—to drive interactive teacher moments within each chapter throughout the book.

FIGURE 0.1 ● Engineering design of culturally relevant mathematics tasks



In *Ask*, teachers consider the important and essential problems and the constraint of teaching. Teachers have opportunities to *Imagine* what culturally relevant mathematics tasks would look, sound, and feel like. With a solid understanding of what culturally relevant math tasks are, teachers work to *Plan* high-quality mathematics tasks and *Create*, design, and adapt culturally relevant mathematics tasks and experiences. Teachers work continuously to *Improve* on the process of task creation as they incorporate quality tasks into lesson implementation and refinement.

This book serves as a pathway for moving through this process, offering tools, examples, and milestones along the way. As such, the engineering design process is used to structure the book in two ways: (1) as an organizing feature of the chapters to signify the major focus of content and major sections and (2) to frame the key experiences for teachers as they move through the content of the book. By this, we mean that these chapters provide teachers with practical guidelines for creating and refining mathematical tasks and lessons through the lens of culturally relevant instruction, they offer opportunities to rehearse approaches for implementation, and they guide teachers in reflection for further growth.

In addition to opportunities for reflection throughout the chapters, you will also find a summary and list of discussion questions at the end of each

chapter. Please take time to pause and think through each of the questions, making a specific commitment to what is presented in the chapter through your response. Our work in this book is based on research and has been honed in our years of working with teachers in a variety of settings. Theoretically, this book is grounded in the research on culturally relevant pedagogy. At the core of the content of the book is the culturally relevant, cognitively demanding rubric in Chapter 3.

While mathematics teaching consists of a wide range of teacher activities, this book focuses unapologetically on mathematics tasks. This is intentional. We see tasks as possible points of liberatory action in mathematics, and we hope this book serves as a useful guide and resource on your journey of empowering your students through culturally relevant mathematics teaching.

Acknowledgments

I want to acknowledge God, family, the network of Black math educators, and math creators too numerous to mention who held space and time over the years to "write this vision."

—Lou Edward Matthews

I would like to thank all the students and teachers who I have learned from over my 30 years as an educator. I want to give special thanks to those students and teachers whose stories are featured in this book, including Courtney, George, Jennifer, Tameka, Ryan, Ramon, and Kayla, my colleague Michelle, and my young friend Chelsea. I give honor to God and extend a heartfelt hug to my family and friends for their unwavering support.

—Shelly M. Jones

I want to thank God for this opportunity, which I do not take lightly; my family for their endless love and support; my students for always challenging me to improve as a teacher; and my colleagues for being the iron that sharpens iron (Proverbs 27:17).

—Yolanda A. Parker

PUBLISHER'S ACKNOWLEDGMENTS

Corwin gratefully acknowledges the contributions of the following reviewers:

Michelle D. McKnight
K–5 Mathematics Instructional Coach
South Windsor Public Schools

Georgina Rivera
Administrator
Bristol Public Schools

Ishmael Robinson
K–12 Math Supervisor
Saint Paul Public Schools

Kaneka Turner
Elementary Math Specialist
ReImage Mathematics

About the Authors

Source: Lou Matthews

Lou Edward Matthews, PhD, is a global mathematics creative and founder of InspireMath, which is committed to building inspiring, sustainable mathematics platforms and culturally relevant education experiences in communities around the world. As Director of Mathematics and Science at Urban Teachers, a national teacher residency program with Johns Hopkins University, Matthews supports the recruitment, coaching, and deployment of culturally competent mathematics teachers in Baltimore, Washington, D.C., and Dallas. In response to the global crisis of racial injustice and the COVID-19 pandemic, Matthews created Pi Before Dinner, a virtual space and media channel for amplifying and illuminating the voices and images of Black children, families, and community in mathematics. The podcast is in its second season on Facebook Live and YouTube and has spawned a website media page and online network of educators and allies. Matthews has served the mathematics community as a leading equity and racial justice advocate, speaker, and scholar. As a mathematics scholar, he has authored studies, book chapters, blogs, and videos on culturally relevant mathematics teaching. He led the creation of the *Journal of Urban Mathematics Education* in 2008. The journal was established to increase the presence and voice of scholars in urban mathematics. Born in Bermuda, Matthews is currently based in the Washington, D.C., area and has been actively involved in national and international initiatives in the United States, Caribbean, and Africa for the past two decades. He has recently established the Inspire Math Foundation and is a past president of the Benjamin Banneker Association and former acting Commissioner of Education of Bermuda Public Schools. He is an avid mountain biker and committed to various community and social issues such as attention-deficit hyperactivity disorder, antiracism, gentrification, and affordable housing.

Source: Dominick Daniels Photography

Shelly M. Jones, PhD, is a professor of mathematics education at Central Connecticut State University (CCSU). She teaches undergraduate mathematics content and methods courses for preservice teachers as well as graduate-level mathematics content, curriculum, and STEM (science, technology, engineering, and mathematics) courses for in-service teachers. Before joining the CCSU faculty, Jones was a middle school mathematics teacher and a K–12 mathematics supervisor. She provides mathematics professional

development nationally and internationally. She has been an educator for 30 years. She serves her community by working with various professional and community organizations. You can see her CCSU TEDx talk on YouTube where she talks about culturally relevant mathematics. She is a contributing author for the book titled *The Brilliance of Black Children in Mathematics: Beyond the Numbers and Toward a New Discourse* and the author of *Women Who Count: Honoring African American Women Mathematicians*. Jones's accomplishments have earned her recognition by the Mathematically Gifted & Black website as a Black History Month 2019 Honoree.

Source: Glen E. Ellman

Yolanda A. Parker, PhD, has been an educator for more than 25 years and has been full-time faculty at Tarrant County College (TCC)–South Campus for more than 10 years in the Mathematics Department where she primarily teaches statistics and mathematics for teachers courses. She has a BS in applied math from Texas A&M University in College Station, Texas; MA in liberal studies from Dartmouth College in Hanover, New Hampshire; and PhD in mathematics education from Illinois State University in Normal, Illinois. She was honored as one of the 2017 "Hidden Figures of Dallas: Top Women of Color in S.T.E.M." by the National Society of Black Engineers, Dallas/Fort Worth Professionals chapter and has been featured in *Women Who Count: Honoring African American Women Mathematicians*. She was also recognized as the campus recipient of the 2017 TCC "Chancellor's Award for Exemplary Teaching," the highest award a TCC faculty can receive. Her research interests include the effectiveness of mathematics manipulatives with adult learners, algebra teacher self-efficacy, and culturally relevant cognitively demanding mathematics tasks.

PART I

Understanding Culturally Relevant Mathematics Teaching

In Chapters 1–3 we set a vision for culturally relevant mathematics task design by exploring shifts in mathematics teaching and learning along with key features of culturally relevant mathematics practices, teaching, and tasks.

CHAPTER 1

What Is Culturally Relevant Mathematics Teaching?

In this chapter we will:

- Identify three shifts in drivers for mathematics teaching and learning
- Distinguish between traditional and reform expectations for classroom practice and how that shapes the teacher's role
- Explore the basic tenets of culturally relevant mathematics teaching

MODERN EXPECTATIONS FOR MATHEMATICS

Modern expectations for mathematics teaching and learning (which we'll broadly refer to in this book with the term *math reform*) are undergoing rapid change. This generation of children will be known as the most racially, linguistically, and ethnically diverse, and more digitally exposed than any previous generation. This dynamic feature of the classroom has pushed us to rethink several essential questions about learning mathematics:

1. How should learners experience mathematics concepts and ideas?

2. How should we teach mathematics dynamically?
3. How can we harness rich cultural and ethnic diversity for powerful mathematics experiences?

In this chapter we will explore each of these questions by examining the three drivers: (1) Shifts in Mathematics Learning; (2) Shifts in Teacher Roles; and (3) Shifts in Making Mathematics Meaningful.

DRIVER 1: SHIFTS IN MATHEMATICS LEARNING

The most significant driver of math reform in the past two decades is a change in what students experience when they actually "do" mathematics. This change moves away from a reliance on simply learning isolated procedures and toward a more active student presence in making meaning. Traditionally, classroom experiences may have consisted of students learning key vocabulary, watching the teacher do guided examples, and then engaging in a lot of independent practice. The singular goal of this script was getting correct answers to prescribed problems.

By contrast, most math reform curricula support classrooms in which students are challenged to use a variety of problem-solving strategies and where they connect, communicate, collaborate, and grow their ideas. For example, the Common Core State Standards (CCSS) for Mathematical Practice describe a set of eight *practices* (Figure 1.1) that feature active student mathematics learning.

FIGURE 1.1 ● Common Core State Standards for Mathematical Practice

Math Practice 1	Make sense of problems and persevere in solving them.
Math Practice 2	Reason abstractly and quantitatively.
Math Practice 3	Construct viable arguments and critique the reasoning of others.
Math Practice 4	Model with mathematics.
Math Practice 5	Use appropriate tools strategically.
Math Practice 6	Attend to precision.
Math Practice 7	Look for and make use of structure.
Math Practice 8	Look for and express regularity in repeated reasoning.

Source: National Governors Association (2010).

ASK

Think about your own experiences in elementary level mathematics. In what ways did you experience the mathematics practices listed in Figure 1.1?

What do you notice as you look at the practices? If you learned mathematics in the past several decades in the United States, there are probably many features that stand out as markedly different from the mathematics you likely experienced growing up. For one, in the very first practice, students are asked to "make sense" of problems and "persevere" in the process. This calls for students having greater awareness of the problem-solving process (a kind of mindfulness, really) as they work problems. The emphasis on persevering is also a focus on student effort and mindfulness as key to problem solving. For example, think about the student who is asked to divide a pile of 25 marbles among 3 people, but mistakenly multiplies and says "75" for each person. When pushed to consider if this is reasonable, the student realizes that there is no way sharing 25 marbles would produce a solution greater than 25. In doing so, the student turns to reconsider division based on their sense making. We love this because it represents a certain attention to strategies and thinking in a way that shifts ownership away from the teacher and onto the student.

One hopeful consequence of taking ownership for problem solving is that students can begin to see themselves as problem solvers. We also imagine, and discuss throughout this book, that they might also see themselves as problem *creators*. This has the potential for students to enjoy the undeniable richness of doing mathematics problems they relate to and enjoy.

The practices also emphasize using the "precision" (see Math Practice 6) of tools and symbols. Yet there is a very deliberate attempt throughout the practices to strike a balance between fluency with procedures and language and interpreting situations in real life. For instance, students are asked to interpret situations mathematically as they "model" and "look for" patterns and "structure." This is the process of mathematizing, and an important function that we will explore throughout this book.

VIGNETTE 1

Mr. Singh is ready to teach his students multidigit addition. He remembers learning "how to carry the one" and not understanding why. He decides that he will teach his students by adding each place value column and then making trades, if any, of the columns with 10 or more. He will have students use base 10 blocks to "make the trades" or regroup. He thinks this will help them understand "carrying the one" in ways that are more meaningful for them than how he learned.

DRIVER 2: SHIFTS IN TEACHER ROLES

The focus on active student sense making requires new thinking for the role of the teacher. In response, the National Council of Teachers of Mathematics (NCTM, 2000) has advocated teachers shift from being a deliverer of mathematical knowledge to playing more dynamic roles of facilitator, guide, and co-constructor of mathematical knowledge. This requires teachers to create lessons that utilize robust and challenging mathematics tasks, which allow students to grapple with important mathematics ideas. Compare that with a more traditional approach where mathematics is seen as static information presented by the teacher, and where a one-size-fits-all instructional approach is applied.

As facilitators, teachers encourage students to share their thinking, refine their strategies, and generate new knowledge. Here, mathematics is not taught as isolated facts and procedures but explored through multiple pathways while making connections to other concepts. For example, imagine a word problem in which students can figure out for themselves that multiplication and addition are possible solution strategies, rather than being told that those are the tools they should use.

Teachers also create meaningful interactions where students learn through collaboration with others in their mathematics community. So even as students are encouraged to utilize a variety of approaches, teachers create spaces and opportunities for them to communicate their constructed ideas, and then support them in the meaning making. A comparison of traditional teacher approaches and reform expectations is depicted in Figure 1.2.

FIGURE 1.2 ● A comparison of traditional views and reform expectations of mathematics teaching

TRADITIONAL VIEWS	REFORM EXPECTATIONS
Mathematics as information to be memorized or applied with correct procedures	Mathematics as dynamic sense making
Teachers as explainers of information	Teachers facilitate rich tasks, discourse, and interactions
Students learn through drill and practice	Students as mathematics meaning makers

Version A

Find the least common multiple of 4, 5, and 15.

Version B

Dylan's mother is running late but can make it to work on time if she catches all green traffic lights on her way to work. The light at the first intersection turns green every 3 minutes, the light at the second intersection turns green every 2 minutes, and the light at the third intersection turns green every 4 minutes. Find the time in minutes that Dylan's mother will first reach all the lights turned green.

Source: Anchiy/iStock.com

ASK

How do these two tasks reflect the differences in reform and traditional expectations?

In version A, and with traditional teaching, students might be led to list the multiples of 4, 5, and 15. Next, students would be directed to circle the first multiple that is common to all three lists. This process is listed in the traditional column as "math as information to be applied with a correct procedure" and "teacher as explainer of information."

With version B, the teacher might instead instruct students to complete the problem using a drawing or other useful method, including making a list of the light times. Students would then discuss the problem with others to consolidate thinking and strategy use. This follows the reform expectation of "the teacher facilitating rich tasks, discourse, and interactions." The context of the traffic lights provides "meaning" to the mathematics. When students reach the first multiple in common with all three lists, they would be using mathematics to "make sense" of the problem.

In strict terms, the traditional and reform approaches seem drastically different. In reality, we find it better to think of a continuum with most practice falling somewhere in between, and even changing often.

DRIVER 3: SHIFTS IN MAKING MATHEMATICS MEANINGFUL

In one of our early experiences supporting teaching of mathematics, one of us conducted a series of workshops called *Making Mathematics Meaningful* with a handful of elementary and middle school teachers in Bermuda in 2001. The phrase itself represents a third driver of what we want to see in modern mathematics classrooms. It is easily the most sensitive and aspirational element—harnessing the power of mathematics in engaging communities of doers. As noted at the beginning of this chapter, students entering today's classrooms will be the most ethnically, linguistically, and racially diverse of any previous generation. Yet, mathematics has a long history of exclusion when it comes to *what counts* as mathematics, *who* can do mathematics, and *who* has access to engaging mathematics.

Mathematics has a long history of exclusion when it comes to what counts *as mathematics,* who *can do mathematics, and* who *has access to engaging mathematics.*

Much of what students have seen honored as the work of mathematicians is presented as white and male. Recently, however, developments in accounting for the history of mathematics reveal powerful insights into the non-European origins of mathematics. The reality of mathematical development is that all cultures have played significant roles in its contribution (Joseph, 2011). In fact, most, if not all, of school mathematics has had some origin outside of European thought. For example, the Ishango Bone uncovered in central Africa has notches that show doubling, prime numbers, and patterns of numbers based on 10. It is dated approximately 20,000 BCE. Another ancient civilization, the Maya of what is now Mexico and Central America, is known for using the first symbol for zero. It is heartbreaking that children don't always see themselves as mathematicians. Exposing children to mathematics' "hidden figures"—Black, Indigenous, and People of Color (BIPOC)—is a powerful message that mathematics is the domain of everyone. Being able to connect who they are to who they see doing mathematics is critical to increasing the diversity of mathematics and STEM (science, technology, engineering, and mathematics)-related jobs and occupations.

We think it is important for teachers to radically rethink how culture and community can complement and challenge teaching. Seeing mathematics identity (Aguirre et al., 2013) as cultural and ethnic identity holds great promise in the new mathematics classroom itself. This is challenging for us because mathematics has been taught through a colorblind lens—that is, as a subject that is "pure" and culturally neutral. When teachers say mathematics is neutral and "1 + 1 = 2 everywhere," they often rob themselves of understanding the contributions of others, or exploring new ways of thinking about mathematics. This position shows up in what comprises much of the work children do in what we call **"naked math."** This is where students see doing mathematics as simply calculating answers using symbols and procedures without much regard to "why." This position has been harmful to all students.

Mathematics as sense making provides opportunities for students to make meaning of things that matter to them.

Mathematics as sense making provides opportunities for students to make meaning of things that matter to them. The goal of culturally relevant mathematics teaching (CRMT) is to move beyond this, as students flourish in doing mathematics when they are connected to the mathematics they learn in authentic ways. But often problem contexts carry implicit cultural assumptions that represent white, middle-class experiences as universal. Authentic experiences in mathematics mean students are able to inquire about themselves and the world around them in familiar and empowering ways. By posing questions that matter to students, they get a sense that mathematics can be used to address and respond to situations in their real life and not just in a textbook.

Authentic experiences in mathematics mean students are able to inquire about themselves and the world around them in familiar and empowering ways.

There is real power in students being able to utilize mathematics to draw critical conclusions that support their hopes and dreams. Harnessing the power of culture and ethnicity in mathematics provides us opportunities to challenge societal issues and norms that limit how historically excluded groups—particularly BIPOC—participate in democracy. We can challenge the inequities that exist in our society *with* mathematics. In general, we will refer to this capacity for action as *agency*. Agency is an essential part of reimagining the mathematics classroom in more authentic ways, which we will talk about more in the next chapter.

To help *all* students reach their fullest potential, we must re-center mathematics through the lens of the students themselves and craft experiences that will be relevant and meaningful to them—especially for those who have been historically marginalized.

CULTURALLY RELEVANT TEACHING

Framed by Gloria Ladson-Billings in her seminal book *The Dreamkeepers*, *culturally relevant pedagogy* describes how teachers utilize culture and community to empower students intellectually, socially, emotionally, and politically (Ladson-Billings, 2009). There are three essential markers of practice for culturally relevant teaching (CRT):

Academic success	The intellectual growth that students experience as a result of classroom instruction and learning experiences
Cultural competence	The ability for students (and teachers) to appreciate and celebrate their cultures while gaining knowledge of other cultures; the ability to help students gain fluency in at least one other culture
Critical consciousness	Involves being able to look critically at knowledge, school, and society with regard to how each has been used throughout history to miseducate, dominate, and marginalize one group of people at the expense of another group

Culturally relevant pedagogy (CRP) or culturally relevant teaching (CRT) allows us to reimagine and re-create what is possible for students in mathematics for several reasons. For one, it challenges us to examine our beliefs about race, ethnicity, and culture. This means reflecting on our beliefs about the nature of mathematics, whose mathematics it is, and for whom it works. It also requires us to explore our mathematical histories, trauma, or privilege arising from our experiences while we consider those of our students.

IMAGINE

How does a vision of culturally relevant teaching challenge what you see as effective mathematics teaching?

We want teachers to become experts in the design of practical experiences to support powerful CRT in mathematics. In our work over the years, we have observed and documented how teachers struggle when they are left to design these kinds of authentic mathematics experiences for their students without adequate tools and support (Jones, 2015, 2018; Matthews, 2003, 2005; Matthews et al., 2013). In the chapters that follow we wish to help teachers to do the following:

1. Understand the key tenets of CRMT
2. Explore strategic approaches for designing **culturally relevant mathematics tasks (CRMTasks)**
3. Constantly refine and improve their work on this journey

ASK

Reflect and discuss how the three hallmarks of CRT are reflected in this episode. In what ways is this kind of teaching similar to or different from what you have experienced? Can you share other examples of CRT? What follow-up lessons might be possible from Vignette 2?

VIGNETTE 2: COMMUNITY GARDEN INTERDISCIPLINARY TASK

Florene, a fifth-grade science teacher, and Elizabeth, a fourth-grade mathematics teacher, collaborated to organize a community garden to address resident concerns about the inability to provide balanced, healthy meals for their families. In a series of lessons, students were asked to explore possible locations in the neighborhood that would provide the most suitable ground and space for the garden and be accessible to residents. Students were asked to design garden plans based on a variety of shapes within the space, complete with measurements for area and perimeter. Residents chose several of the designs and worked with students after school hours to grow food.

FUNDAMENTALS OF CULTURALLY RELEVANT TEACHING OF MATHEMATICS

Our vision of CRMT draws from both math reform goals and cultural and social justice approaches to teaching, working together to radically transform student outcomes and quality of life (Enyedy & Mukhopadhyay, 2007; Gutstein et al., 1997; Leonard & Guha, 2002; Matthews, 2003; Tate, 2004). Although CRT in general can include a myriad of teaching styles from traditional to modern, we stress connections with modern mathematics' expectations that represent the educators we serve. Gutstein et al. (1997) denoted important connections for math reform and CRT, namely: (1) fostering critical mathematical thinking as well as critical consciousness, (2) building on students' informal mathematics knowledge and their cultural knowledge, and (3) promoting empowerment orientations to students' culture and experience rather than their deficit orientations.

CRITICAL CONSCIOUSNESS

involves being able to look critically at knowledge, school, and society with regard to how each has been used throughout history to miseducate, dominate, and marginalize one group of people at the expense of another group (Ladson-Billings, 1994, 1995b)

In Vignette 3, Ms. Cooper learns about Val Jean's crocheting skills and uses that knowledge to teach a multiplication lesson to her third-grade class.

VIGNETTE 3: BUILDING ON A STUDENT'S INFORMAL MATHEMATICS KNOWLEDGE

Val Jean's grandmother is constantly crocheting. She makes blankets, hats, and scarves for family members, but especially when a new baby is coming. Val Jean's grandmother taught her how to crochet when Val was just five years old. Two years later, it was time for Val Jean's mom to have a baby so Val Jean crocheted a blanket for her baby sister. She sees a pattern in her stitches. Every row has 20 stitches and there is a different color every three rows. Val Jean was very excited to tell her grandmother that the blanket has mathematics in it. When Val Jean tells her teacher, the teacher uses the baby blanket as an example to teach the class double-digit multiplication.

The teacher used Val Jean's pattern of stitches to help students see multiplication as an array using the rows of the blanket. Val's informal knowledge of crocheting was directly connected to the formal procedure of multiplying numbers using arrays. The skill of crocheting was cultural because it was a family tradition handed down from Val Jean's grandmother to her mother and also to her, the granddaughter. Family traditions can be used as mathematical contexts and a jump board for teaching formal mathematics procedures.

As mathematics teachers engage in CRMT, they are committing to the design of mathematics environments as extended, interconnected spaces centered on the realities of students' racial/cultural identities and communities (Matthews, 2009). In this way, teachers will design lessons that center, extend, and connect with students' racial and cultural identities and communities. They also attend to the organization of instruction in ways that underscore deliberate, empowering relationships with students and community. Teachers who engage in this kind of teaching also work to select, design, and use mathematics tasks that highlight students' experiences through cultural and community inquiry. Finally, they often challenge and enhance mathematics curricula in creative ways. In summary, we define *CRMT* as teaching that is focused on

1. challenging mathematics experiences where children have access and are positioned as successful doers and creators of mathematics;
2. mathematics contexts, prompts, and inquiry from culture and community sources; and
3. activity/task outcomes for hope, empathy, and **critical agency** as children practice mathematics.

RIGOR AS A FLOOR FOR INTELLECTUAL AND CULTURAL MATHEMATICS EXPERIENCES

The foundational principle of CRT is *academic excellence*. In this component, students are viewed as capable of engaging intellectually as doers *and producers* of mathematics. A common approach to excellence has been the call for high expectations. However, we see equity as much more than simply having high expectations for all students. Equity in school mathematics should also include access to high-quality design of learning experiences as well as a commitment to mathematics learning immersed in culture.

Equity in school mathematics should also include access to high-quality design of learning experiences as well as a commitment to mathematics learning immersed in culture.

Rigor is an important component of high-quality learning. We refer to rigor in the intellectual sense as having sufficient *mathematical complexity,* and as such, it places *meaningful cognitive demands* on the learner. Access to mathematical complexity is critical to the success of learners in school, which then extends to their day-to-day life activities and ultimately the access they will have to many careers. Students deserve access to mathematical complexity regardless of race, culture, and/or identity. We hold that it should be seen as a baseline requirement for engaging in high-quality mathematics—not a ceiling. As we journey on, we are also careful to expand the notion of rigor to that of culture as well.

Another way of looking at rigor is to think beyond notions of intellectual challenge. We also expand rigor as *careful, deliberate attention to student culture and community*. That is, rigor refers to an embracing of complexity, both intellectual and relational.

CULTURE AND COMMUNITY AS A CENTRAL SOURCE OF MATHEMATICS ACTIVITY

Using what students know and have experienced previously is an important feature for effective mathematics teaching, as highlighted in NCTM's *Principles and Standards for School*

Mathematics (2000). Understanding the source of student knowledge and placing students' culture and experience at the center of mathematics learning are critical to engaging children in mathematics. We borrow the phrase *building on students' informal and cultural knowledge* (Gutstein et al., 1997) to describe how teachers use cultural knowledge as a part of understanding prior experiences. These informal, cultural mathematics experiences can be found in the home and extend into community/culture. We'll talk more about the *how* throughout the book.

Understanding the source of student knowledge and placing students' culture and experience at the center of mathematics learning are critical to engaging children in mathematics.

IMAGINE

Choose a movie or cultural media artifact that represents a powerful narrative of the informal experiences of your students. Create a critical friends review with a group of colleagues around the potential of these experiences to teach mathematics.

The mistake teachers and other educators often make is that they consider learning as a process for individual learning with the omission of cultural and social influences. Further to the point, constructivism, the dominant learning theory embraced by many mathematics educators and promoted in mathematics education reform, has been criticized for its sole emphasis on individual differences at the expense of social and cultural differences (see Taylor, 1996; Zevenbergen, 1996). Alternatively, with CRP, learning is centered on the collective culture of students by understanding differences in student culture and the role they play in mathematics instruction.

ASK

Is learning individual or cultural? What are the implications of either view for teaching mathematics?

Are you a member of the community where your school is located? If not, it can be helpful to compare your own community with that of your students. Following is a simple activity that can help you start getting more familiar with the community and culture of your students.

One day on your way to work, take notice of the number of establishments you pass in your neighborhood compared with the number near your school (see Figure 1.3).

FIGURE 1.3 ● Community Walk Checklist

ESTABLISHMENT	TALLY IN YOUR COMMUNITY Circle One: Rural, Urban, Suburban	TALLY IN SCHOOL COMMUNITY Circle One: Rural, Urban, Suburban
Churches, mosques, temples, and other places of worship		
Liquor stores		
Grocery stores		
Check-cashing businesses		
Playgrounds		
Multifamily buildings (e.g., apartments, duplexes)		
Doctor/dentist offices		
Urgent-care locations/walk-in clinics		
Laundromats		
Hair salons/barbershops		
Community centers		
Shopping malls or shopping centers		
Empty lots		
Dollar stores		
Gas stations		
Fast-food restaurants		

MATHEMATICS AS A PRACTICE OF CRITICAL AGENCY AND ACTION

Teaching mathematics in a way that redefines *critical thinking* for students within and outside of the school setting is another important connection for standards-based mathematics reform with CRP. Critical consciousness involves being able to look critically at knowledge, school, and society with regard to how each has been used throughout history to miseducate, dominate, and marginalize one group of people at the expense of another group (Ladson-Billings, 1994, 1995a). The goal of developing critical consciousness in students is to promote social justice, as well as individual and collective empowerment.

PLAN

Based on the variety of establishments you passed the closer you were to your school, what does that say about the community in which your students live? How can you use that information to create empowering tasks for your students?

Correspondingly, critical mathematical thinking includes "making conjectures, developing arguments, investigating ideas, justifying answers, and validating one's thinking" (Gutstein et al., 1997, p. 718). Therefore, a critical consciousness motive—critical agency—in mathematics learning allows teachers to help students expand their critical mathematical thinking in ways that challenge inaccurate knowledge and question unjust societal and schooling practices and policies.

VIGNETTE 4: RURAL SCHOOL DISTRICT MATHEMATICS TASK

Mr. George works in a rural regional school district in a small Northeastern state. As part of a unit on comparing fractions, he explored with his students the inequity of access to health care in rural areas. The students started class by having a discussion with their groups of what a primary care physician (PCP) is. Then, they discussed what it means to live in a rural area. This led to a class discussion of how far each student travels to see their family doctor. Mr. George was surprised to find out that about half of the students reported only going to walk-in clinics when they are sick. Some other students reported driving at least 30 to 40 minutes to a larger city to see a doctor. Students worked in groups to find the population of selected counties in their state and the corresponding number of PCPs in each of those counties. Mr. George asked students why just reporting the number of PCPs was not enough to determine an inequity. This was a tough question for these fourth graders to put into words.

IMAGINE

How does this lesson end? What do you think the students learned about their community in this lesson? What mathematics helped them to understand this issue?

Summary and Discussion Questions

In this chapter, we shared expectations of modern mathematics and fundamental ideas to CRMT. In particular, expectations for modern mathematics include shifts in mathematics learning, teacher roles, and the meaningfulness of mathematics. We also discussed ideas that are fundamental to CRMT. For instance, students deserve access to mathematical complexity regardless of race, culture, and/or identity as a baseline requirement for engaging in high-quality mathematics—not a ceiling. Also, culture and community are central sources of mathematics activity, reinforcing the idea that mathematics learning is centered on the collective culture of students by understanding differences in student culture and the role they play in mathematics instruction. And finally, mathematics is a practice of critical agency, which allows mathematics teachers to help students expand their critical mathematical thinking in ways that challenge inaccurate knowledge and question unjust societal and schooling practices and policies. Before we explore and expand the features of CRMTasks and culturally relevant mathematics practices (CRMPractices) in the next chapter, consider the following discussion questions to reflect on the topics we just covered:

1. What are your beliefs about the nature of mathematics, who can do it, who it is for, how it should be taught, and the role of culture? What are some ways that mathematics and culture complement each other?
2. How would you describe the student culture at your school, and how can you tap into the richness, uniqueness, and diversity of that culture to enhance your mathematics instruction?
3. What is one current social issue in your students' communities, and how could you use mathematics to illuminate that issue for students?
4. What adjustments have you made or can you make as a teacher to take on a less active role, encouraging students to be co-creators in the problem-solving process?
5. How do you create a space where students can take a more active role as collaborators?

CHAPTER 2

Imagining Culturally Relevant Teaching Through Mathematics Practices and Tasks

In this chapter we will:

- Expand the definition of *mathematics tasks*
- Explore culturally relevant mathematics practices
- Illuminate the importance of mathematics tasks in creating culturally relevant mathematics experiences
- Explore features of culturally relevant, cognitively demanding mathematics tasks

Mathematics tasks are the chief means for how children participate and experience mathematics in the classroom. Yet too many students face unimaginative, cookie-cutter experiences drawn from paid websites, picked up in staff lounges, or copied from stock textbooks. While these are each legitimate sources for tasks, we often see missed opportunities here for teachers to fully embrace the power of the instructional core.

The instructional core consists of three active components: (1) what the teacher *says* and *does*, (2) what students *say* and *do*, and (3) the task *structure* and *design* as utilized by the teacher. At any given time, these dynamics are activated in the classroom. With each of the core components, the teacher is directly responsible for how students engage mathematics through the task, discourse, and interactions rising out of the classroom. In the following sections, we'll explore why and how tasks are great platforms for CRT and provide a catalyst for cognitive challenge in mathematics.

One of the questions we consistently encounter in our work with teachers is, "What does this look like in practice?" To answer this question, we will explore examples of what students might do and how tasks support CRT, and we will provide a list of features of CRMTasks.

EXPANDING THE DEFINITION OF MATHEMATICS TASKS

Before we begin the design process for creating CRMTasks, let's expand the definition of *mathematics tasks*. According to Stein et al. (2000), a **mathematical task** is defined as "a single problem or a set of problems that focuses student attention on a mathematical idea." As we focus on the structure of a task, we seek to name what we believe are key parts to many of the mathematics tasks that teachers come into contact with. For purposes of understanding the structure of mathematics tasks, we want to look at four organized dimensions that we feel encapsulate the mathematical and social/cultural constraints of mathematics tasks used in the classroom:

1. Mathematical Inquiry Prompt
2. Mathematics Constraints/Conditions
3. Cultural Context
4. Sociocultural Inquiry Prompt

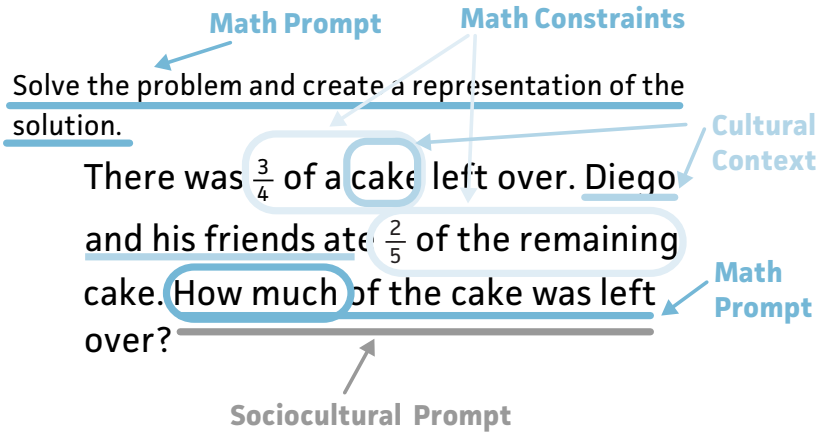
MATHEMATICAL INQUIRY PROMPT

The first element we define is what many will see as most common to any mathematics task—the *mathematical prompt*. A mathematical prompt is a specific question or direction for which the problem doer must directly respond or engage. Take, for example, 2 + ___ = 11. The "blank" serves as the mathematical prompt, urging the doer to find a solution that satisfies the given equation.

MATHEMATICS CONSTRAINTS/CONDITIONS

Mathematics constraints represent the content, language, and representations that define problem constraints (limitations on a solution approach), mathematical assumptions, and conditions that help the learner hone in on key concepts and procedures needed to unlock the mathematics inquiry. In the problem in Figure 2.1, the content involves finding a fraction of a fraction and consideration of what happens as the "whole" changes with fraction products.

FIGURE 2.1 ● Word problem structure of a culturally relevant mathematics task



CULTURAL CONTEXT

CULTURAL CONTEXTS
Settings and situations in which mathematical tasks are embedded and are given for the purpose of assisting learners to draw from hopefully familiar referents when tackling mathematical ideas.

Mathematics tasks and applications are typically situated in some kind of context to help students make sense of the task and relate it to the real world. We explicitly label this as cultural and argue that all mathematics—like all human knowledge—is inherently cultural and social. **Cultural contexts**, therefore, are settings and situations in which mathematical tasks are embedded and are given for the purpose of assisting learners to draw from hopefully familiar referents when tackling mathematical ideas. Cultural contexts include the explicit, implied, or hidden values and practices of a particular culture. Culture can be relevant to specific ethnicities, cultural groups, and communities. We see culture in this sense as dynamic, fluid, boundless, and intersectional. In Figure 2.1, the cultural context is that of a gathering of friends of Diego (a name that might be associated with Latinx culture). The context itself is fluid and not absolutely an element solely of a particular group (this activity is common in many cultural and community settings). The many ways in which this context can be interpreted should be seen as an asset in creating culturally relevant experiences.

SOCIOCULTURAL PROMPT

Provides specific direction or requirement for the learner to address social, cultural, and/or political conditions in the context.

SOCIOCULTURAL INQUIRY PROMPT

The **sociocultural prompt** provides specific direction or requirement for the learner to address social, cultural, and political conditions in the context. The presence of a sociocultural prompt is an opportunity to engage in both cultural competence and critical consciousness—two key components of CRT. Sociocultural prompts can be extracted from common character and ethics programs already in schools as well as important historical accounts and current social and political events. We see good prompts as those that ask students to inquire culturally and socially.

ASK

Choose four tasks from your current curriculum or practice and conduct an analysis of the structure using the four elements. Do they seem to be missing any of the dimensions? If so, which one(s)? How might you include those missing elements? Which element seems strongest?

In the fraction problem in Figure 2.1, the cultural context, mathematics constraint/conditions, mathematical prompts, and sociocultural prompt are given.

We consider the sociocultural prompt in the task particularly "light." In the task we used, we think that cultural exploration goes beyond trivializing what is left of the cake. We'll continue to argue in this book that sociocultural prompts are powerful (often missed) opportunities to engage the students in the world around them.

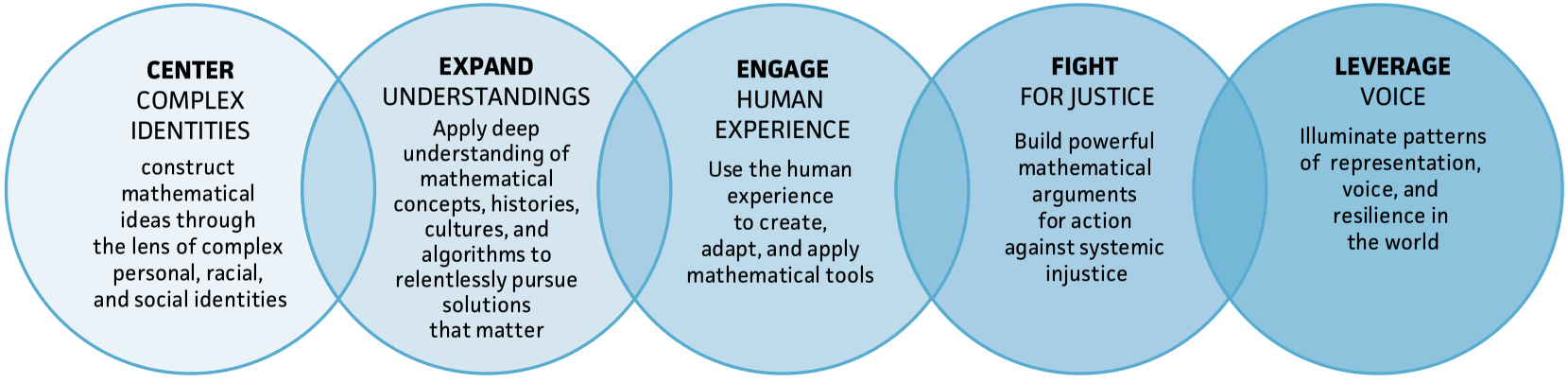
WHEN CHILDREN THRIVE: CULTURALLY RELEVANT MATHEMATICS PRACTICES

Our journey to explore what CRMT looks like for students starts with *practices*. In 2020, a team of educators worked on a national project to challenge and extend how popular *mathematics practices* (known widely as Common Core Mathematics Practices) can integrate important elements of authentic human experience similar to the ways in which children experience art, music, or play. This 100Kin10 Project Team created five practices to describe the ways in which children might experience mathematics authentically:

1. Center Complex Identities
2. Expand Understandings
3. Engage Human Experience
4. Fight for Justice
5. Leverage Voice

Taken together, the *Culturally Relevant Mathematics Practices* (Figure 2.2) envision mathematics learning, whether in a face-to-face classroom setting, virtual online space, or some hybrid, as a space where learners thrive and find voice and meaning in the mathematics that they do.

FIGURE 2.2. ● Culturally relevant mathematics practices



Let's take a look at each of these practices in more depth.

CENTER COMPLEX IDENTITIES

With *Centering Complex Identities*, learners draw from their own identity and those of others as they seek to make sense of mathematical ideas, solve problems, and probe context and nuances of the solutions and applications with which they engage.

VIGNETTE 5

When working with a group of students who participated in a STEM program, we led an icebreaker activity that involved students describing themselves through the use of hashtags. Each student was given the opportunity to present their hashtag. When one student shared #Muslim, another student unmuted and said, "I'm Muslim too." Later on in our mathematics activity, students shared a photo of something in their home or community that represented mathematics. Maryam, the student who shared the #Muslim hashtag, posted a photo of a sofa in her living room that had an Islamic tessellation design. This scenario provides a wealth of opportunity for the teacher to use this student's ethnic and religious identity to teach a lesson about the transformations that exist in Islamic tessellations as well as other tessellations that students discover and/or create.

IMAGINE

Think of a mathematics scenario where children explore or inquire about various aspects of their identity and belongingness.

Over the past two years, we've gone into countless classrooms to introduce students to the stories of African American women mathematicians. The students are always curious about the personal lives of the women, asking questions like, "Does she have children?" and "What is her dog's name?" They also want to know how the women persevered in mathematics (our word, not theirs) because mathematics is so difficult. One student was so interested in Katherine Johnson from the movie *Hidden Figures*, she wrote a play about Mrs. Johnson, which she and her friends starred in at school.

When students are able to bring themselves fully into the mathematics classroom like this, their enthusiasm is boundless. We have seen students call it a "fun day" because they are doing mathematics that actually relates to their lives and interests. In these "fun" lessons, students don't have to ask, "When am I gonna use this?"

EXPAND UNDERSTANDINGS

Another powerful practice we love in the elementary space is *Expanding Understandings,* which focuses on how learners understand mathematics deeply to include histories, cultures, and ways of knowing, along with the understanding of concepts and algorithms.

When students are learning a mathematics concept, they want to understand it deeply, and they are willing to ask questions as long as they know their questions will be considered. Students can tell the difference between a teacher who doesn't answer questions because they want you to find a way to answer on your own, versus a teacher who makes you feel inadequate because you are asking too many questions. We have found that students prefer to do mathematics when they can do it their own way—that is, when they are empowered to discover the solution themselves. When students are provided the opportunity to do it their own way, the mathematics comes from the student; they are not merely mimicking the teacher. When students are required to follow a procedure exactly how the teacher does it—for example, "I do, we do, you do"—students learn that mathematics always comes from an authority like the teacher (and/or the textbook) and not from themselves.

> *Martha was so excited about the next assignment in Mr. Kuumba's class. He said that students would be able to have a choice on how they would show their work. She felt relief from the pressure to do it "the right way" and instead looked forward to showing her teacher her own "right way"—the way that made the most sense to her.*

Students enjoy multiple means of engagement, representation, action, and ways of expressing their understanding. When they are able to use their strengths to show their understanding of mathematics concepts, they develop confidence and positive mathematical identities.

When you ask these students about mathematics, they will often tell you about something they learned in mathematics, how mathematics is connected to their real life, or how mathematics could be used to help them understand something happening in their community or in the world. They can relate mathematics to their own lives because they were given the freedom and respect to embody it in themselves.

ENGAGE HUMAN EXPERIENCE

Engaging Human Experience, along with *Fighting for Justice* and *Leveraging Voice,* provides opportunities for young learners to explore mathematics problems that are encased in social and community issues, extending the students' roles as problem solvers beyond "neatly" curated pizza or chocolate bar problems.

Responsive learners who embrace *Engaging Human Experience* use mathematics models and tools as important ways to uplift and cherish the human experience. For example, early learners can explore the many ways in which cultures and communities use counting in their daily routines. Students might learn how teachers count the number of students in class every day, the librarian counts the number of books students check out, a farmer counts the number of livestock they have, and the cashier in a grocery store counts the number of people in their line. One notion that has historically been frowned upon in Western cultures is finger counting, but the tool is "naturally available and cognitively utilizable" (Bender & Beller, 2012, p. 157) and is a perfect way for young children to truly embody and interact with the mathematics they are doing in their daily lives.

During the COVID-19 pandemic, some students were forced to do what they termed *learn on my own*. Students found it tremendously difficult to do "school mathematics" at home while juggling shared technology, low bandwidth, and competing home and school responsibilities. While students may not have kept up with their regular mathematics assignments, there is no doubt that they have participated in mathematical experiences over the pandemic year learning at home.

Some teachers used this time as an opportunity to use human experience to have students create, adapt, and apply mathematical models. For example, the Common Core Math Content Standard 3.MD.B.3 asks students to represent and interpret data—any data, including those in the world around us. Over the pandemic many families spent more time together—taking walks, riding bicycles, and overall spending more time outdoors—which was a great opportunity to ask students to notice the mathematics in their community. For example, students could notice and record the types of trees, shapes of leaves, types of residences, shapes and sizes of rocks, shapes of structures in the community, and so on. Not only are they being encouraged to engage with the world around them, but they could also use this information to model "things in our community."

ASK

What are three concrete ways your students might uplift and cherish the human experience through mathematics?

FIGHT FOR JUSTICE

Young children know fair when they see it and when they feel it. So when an elementary school teacher wants to engage students in teaching mathematics with a social justice lens, they should design student-centered mathematics opportunities based on their students' social interactions with the world. When students are bullied, they know it is not fair. When students recognize that most of their classmates are students of color but most of the students in the higher mathematics groups are white, they have a sense that something is not right, even if they can't articulate it. Students learn about words like *poverty* and *racism* in their language arts and social studies classes, but too often these essential topics are left out of mathematics lessons. In mathematics, teachers can broach these difficult topics by first asking students what issues they'd like to learn more about and then using numbers to help students tell a story. Even in elementary school classrooms, we can help students use mathematics to construct viable arguments and critique the reasoning of others (see Math Practice 3) to prove a social and/or racial injustice.

VIGNETTE 6

A school in a small town was scheduled to close because of low enrollment. The school's demographic makeup was 70% students of color, and most of the students receiving mathematics intervention were students of color. During their mathematics lessons with the Math Interventionist, students expressed they were upset their school was the one chosen to close. They were under the assumption that the school was closing because it was old and beyond repair, but on researching other school closures in the area, and the United States at large, they learned that many schools with high percentages of students of color are often closed. Ms. Flag, the Math Interventionist, used this opportunity to have the students explore the school closing using mathematics. They researched the transportation costs that would be required if they had to attend a new school. They used their data to make a case against closing the school. Even though the school did eventually close because it was said to be the oldest building, this activity provided students the opportunity to fight for justice using meaningful mathematics to tell their story.

LEVERAGE VOICE

If you want to learn about issues that affect students, you must ask them. Students are usually more informed than we give them credit for, and they are full of thoughts, feelings, and opinions about significant issues. To leverage student voice in positive ways, we must illuminate patterns of representation,

resistance, and resilience in the world. In mathematics there are many ways to immerse students with positive representations of diverse people. Teachers can use a variety of resources (https://mathematicallygiftedandblack.com/; https://www.lathisms.org/; https://www.indigenousmathematicians.org/about-us/) to bring in stories of resistance and resilience. One such story was told by Dr. Christine Darden when she spoke about the resilience of the women featured in the book *Hidden Figures: The American Dream and the Untold Story of the Black Women Mathematicians Who Helped Win the Space Race* (Shetterly, 2016). She noted how each of them had to overcome challenges to achieve their goals. She herself had to take extra mathematics courses in her senior year of college in order to earn a mathematics degree in addition to her teaching certificate; Mary Jackson had to get permission to take classes at an all-white segregated school; Katherine Johnson had to overcome racism and sexism in her role as a Human Computer; and Dorothy Vaughan had to self-learn a computer programming language so she could keep her job at NASA.

TASKS AS OPPORTUNITIES TO BUILD MATHEMATICAL THINKING

We see the critical work in this book as focusing on the mathematics *task*. Inquiring through mathematics tasks provides opportunities for students to practice mathematics in the context of who they are and their relationships to others and the world around them. Modern mathematics reform (as we covered earlier) requires that teachers identify, create, and even transform traditional mathematics tasks to engage students' thinking. These tasks should emphasize the learning of rich mathematics concepts, multiple representations and strategies, and the communication of one's reasoning when problem solving (NCTM, 2000).

Consider a commonly used example, the handshake problem, below:

> The handshake problem is a popular task to get students thinking about strategies to count the number of handshakes that will occur between "*N*" number of people. Students must think about handshakes and determine that when Person A shakes the hand of Person B then Person B has also shaken Person A's hand. Therefore we don't double count those handshakes. If we have two people, there is one handshake. If we have three people, we have the following: A shakes B, B shakes C, and A shakes C for a total of three handshakes. What happens with four people? Five people? Ten people? *N* people?

The handshake problem is rich because there are multiple strategies and entry points that students can use to solve the problem. Students might draw a picture or graphic to help them. They might make an organized list or act it out. They might use more complex strategies like creating a table and finding a pattern. Students who are ready could even determine an equation that could help generalize the pattern. A teacher could use this type of open-ended problem to create a culture of discourse in the classroom. The multiple entry points allow for all students to engage at different levels, from drawing a picture to creating an equation.

Choosing rich tasks like the handshake problem provides an opportunity to build students' mathematical thinking. These tasks can be reengineered to support cultural inquiry, engaging students in investigations formulated in local or cultural contexts. For example, instead of merely shaking hands, the teacher could include a local context.

Source: monkeybusinessimages/iStock.com

Aja's extended family has an annual family reunion. At the reunion this year, the family gathered around to greet each other with a fist bump. With 2 family members, there is one fist bump. With 3 family members, there are three fist bumps. Use the names in your extended family to determine how many fist bumps will occur with 5 family members, 10 family members, any number "*N*" family members.

Building mathematical thinking supports students in experiencing academic success, a key component of CRT.

NOT JUST ANY TASK: COMPLEXITY MATTERS

In addition to being a platform for CRT, good mathematics tasks provide opportunities to challenge students by exposing them to the "right kind of hard." Challenging students with complexity in the tasks they do raises the bar for modern classrooms. According to the NCTM (2000), tasks that have the most potential to grow student thinking focus on rich mathematical concepts, allow for multiple ways of representing ideas, and require communication. Embracing and building tasks around mathematical complexity lead to important opportunities for learners.

Good mathematics tasks provide opportunities to challenge students by exposing them to the "right kind of hard."

Compare the difference in a task such as the simple written equation of 3 × 5, in which a student is asked to recall a memorized multiplication fact, versus a task that asks students to choose whether three groups of five or five groups of three is the best representation for a given word problem. Both kinds of tasks are necessary, but they offer varying levels of cognitive effort.

ASK

Scan an upcoming mathematics lesson for tasks. Describe the balance of lower cognitive level and higher cognitive level demanding tasks. What do you notice?

In our work with new teachers, we ask them to take note of what Stein et al. (2000) define as *lower-level* and *higher-level* cognitive demand in mathematics tasks. **Lower-level demand tasks** typically require less cognitive effort and involve recitation of number facts or using procedures and algorithms in isolation. **Higher-level demand tasks** are cognitively demanding tasks that require students to use procedures in ways that build conceptual understanding of important concepts. In general, we use the term *demand* to refer to mathematical complexity.

In many mathematics textbooks, the percentage of lower-level tasks will typically outnumber the cognitively demanding tasks. The higher-level tasks are often nonalgorithmic and unpredictable, and require multiple ways of representing concepts. Open-ended word problems, for example, involve a series of steps and often require representations including symbolism, graphs, and verbal explanations. Hence, open-ended word problems tend to be on the higher level on the complexity scale.

Another benefit of higher-level tasks is that students often have to draw from their informal experiences to make sense of problem contexts. In the example below, if the student is familiar with the Puerto Rican dessert tembleque, they will find a connection between mathematics and real life.

Source: SkyClear/iStock.com

Around the holidays my mom always makes a large pot of tembleque, a delicious coconut custard, to share with family and friends. When finished, she has 8 quarts of the custard. She will give $\frac{2}{3}$ quart to each family. How many families will receive Mom's delicious gift? Show your work using a picture and a mathematics procedure.

We do not suggest that teachers avoid low-level tasks altogether. But an important criterion for cultural relevance is the presence of high expectations and the potential for academic success. Challenging students with the right kind of hard gives students the best chance of being successful in mathematics. Whether or not students personally know about tembleque, they can use pictures to show how to divide eight containers into thirds and then count off $\frac{2}{3}$ for each family. This would be a great time to query students about their holiday traditions.

TASKS AS OPPORTUNITIES TO PRACTICE CULTURALLY RELEVANT TEACHING

Packed within mathematics tasks are messages about what mathematics is and what it means to do mathematics. Also implicit are ideas about context, that is, what is to be valued, and for what purposes. Our basis for creating CRMTasks lies in exposing students to as many higher-level tasks as possible. We see this in many ways as a fundamental element of CRT—that children have access to challenging opportunities through which to thrive and develop. This can happen in several ways. When students are asked to explore relationships between what is happening in real life and the procedure for finding a solution, they have the opportunity to make meaningful social and cultural connections.

In the early elementary grades, students are often asked to sort collections of objects. The opportunity here is to have students bring in items from home to sort or have students collect items at home, sort them at home, and then describe their process during carpet time. This type of activity provides an opportunity for students to share about their home life, which they love to do. It also helps students get to know one another. Students' roles at home are part of their identity, so it is important to allow students' whole selves into the classroom each and every day. In fact, celebrating their multiple identities helps in their identity development. Consider the following activity.

Source: flariv/iStock.com

Ask students to bring in the plastic tabs used to keep plastic bread bags closed. Most families eat some type of bread or product that comes in these types of bags. Use the tabs in a sorting activity and then have a discussion about the type of bread families eat, such as various types of sliced bread (white, wheat, gluten free, etc.), cornbread, focaccia, challah, tortilla, baguette, pita, fry bread, and naan (to name a few). Explain to students that some people are unable to eat bread and may use a bread substitute like tostones (fried green plantains) or bread made from grains other than wheat flour.

Another way tasks provide opportunities for CRT is that they allow for exploring issues and contexts that arise in day-to-day living. By doing this, students can come to appreciate, acknowledge, and even learn more about the personal, community, and

cultural things that help them thrive and develop. Tasks can also provide the means of helping students respond to challenges of the day, discerning patterns and taking stands for social justice and action, as illustrated in the example below.

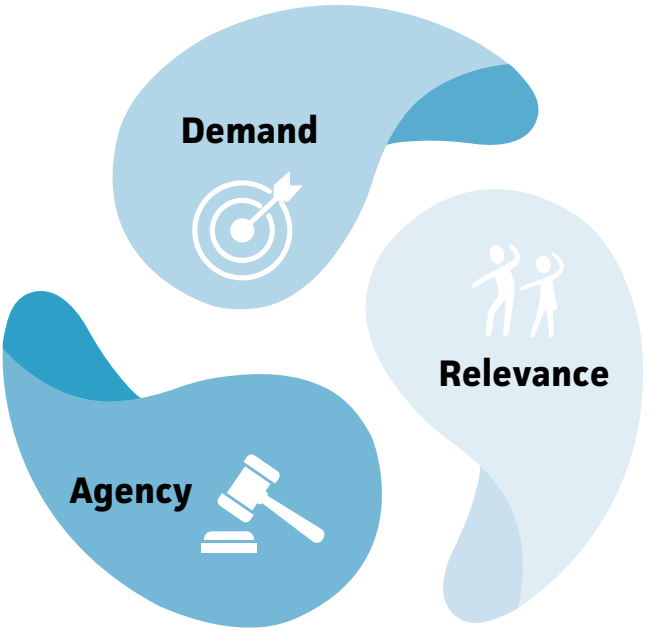
VIGNETTE 7

Mr. Gooding is planning to do a unit with his kindergarteners called Kindness Counts. The goal of the unit is to have students compare quantities and numerals in order to investigate an issue relevant to them and then be able to use mathematics to justify changes they feel are needed. He decided to do a unit on kindness because some of his students had been expressing concern over their peers' lack of kindness. At the start of this unit, students will identify what kindness is, and then each student will share their thinking about the class's level of kindness. To evaluate the data that were collected, students will explore strategies to compare numbers and quantities with physical manipulatives and classroom tools. Students will then engage in goal setting and identify a number of kind acts they hope to see over the course of three days. They will work to compare numerals, and discover how counting can help them determine which is more, less, or the same. Later in the unit, students will engage in their own data collection by using mathematical tools to create their own way to count acts of kindness. This unit could be adapted to use with any easily observable problem kindergarten students may be having, whether it be kindness, safe actions, following a certain rule, responsible acts, and so on.

FEATURES OF CULTURALLY RELEVANT MATHEMATICS TASKS

Based on the importance of high-level, cognitively demanding mathematics tasks and CRT, let's define *culturally relevant mathematics tasks* as tasks (1) with high cognitive *demand*, (2) where culture and community are the source of mathematics inquiry (*relevance*), and (3) where individual and collective *agency* are the intentional outcomes (Figure 2.3).

FIGURE 2.3. ● Culturally relevant mathematics task dimensions



Source: Demand icon by Fourleaflover/iStock.com; Agency icon by MicrovOne/iStock.com; Agency icon by Tanya St/iStock.com

As a more comprehensive list, CRMTasks

- are mathematically rich, higher-level, cognitively demanding, and embedded in cultural activity;
- explicitly require students to inquire (at times problematically) about themselves, their communities, and the world about them;
- include content drawn from students' community, cultural identities, and experiences;
- affirm student belonging and culture—an empowerment and learning orientation (vs. deficit or color-blind orientation). A task may explicitly seek to add to this knowledge through mathematical activity;
- ask students to respond to, overcome, and challenge discontinuity and divide between school and their own lives;
- require students to use mathematics to discuss and make sense of the world around them. The stated goal of the task is to make empowered decisions about themselves, their communities, and the world.

In the next chapter, we will further explore these features and begin to examine how to assess and create CRMTasks.

Summary and Discussion Questions

In this chapter we expanded the definition of *mathematics tasks*, explored CRMPractices, illuminated the importance of mathematics tasks in creating culturally relevant mathematics experiences, and explored features of culturally relevant and cognitively demanding (CRCD) mathematics tasks. We presented the following four organized dimensions, which encapsulate the mathematical and social/cultural constraints of mathematics tasks used in the classroom: (1) mathematical inquiry prompt, (2) mathematics constraints/conditions, (3) cultural context, and (4) sociocultural inquiry prompt. Based on the importance of high-level, cognitively demanding mathematics tasks and CRT, we define *CRMTasks* as tasks (1) with high cognitive demand, (2) where culture and community are the source of mathematics inquiry (relevance), and (3) where individual and collective agency are the intentional outcomes. Throughout the book we will use the idea of *CRMPractices* where learners thrive and find voice and meaning in the mathematics that they do. Before we move on to further explore these features and begin to examine how to assess and create CRMTasks in the next chapter, consider the following discussion questions to reflect on the topics we just covered:

1. Reflect on the instructional core elements from the last powerful lesson you taught—(1) what the teacher says and *does*, (2) what students *say* and *do*, and (3) the task *structure* and *design*. What opportunities did you have for CRMT? How did you respond to these opportunities?
2. In this chapter we mentioned the "I do, we do, you do" model that is familiar to many teachers. However, how can you effectively teach students who are struggling with finding a point of entry, without starting with "I do" for them to mimic your problem-solving strategies in order to discover their own? How could you utilize that approach in the task you chose for the above question?
3. CRMPractices envision mathematics learning as a space where learners thrive and find voice and meaning in the mathematics that they do. Which of the practices do you find most aligned with what you currently do in your instructional core?
4. Embracing and building tasks around mathematical complexity lead to important opportunities for learners. What are some important opportunities that your learners experienced in the task from question 1?

CHAPTER 3

Creating and Assessing Culturally Relevant Mathematics Tasks

In this chapter we will:

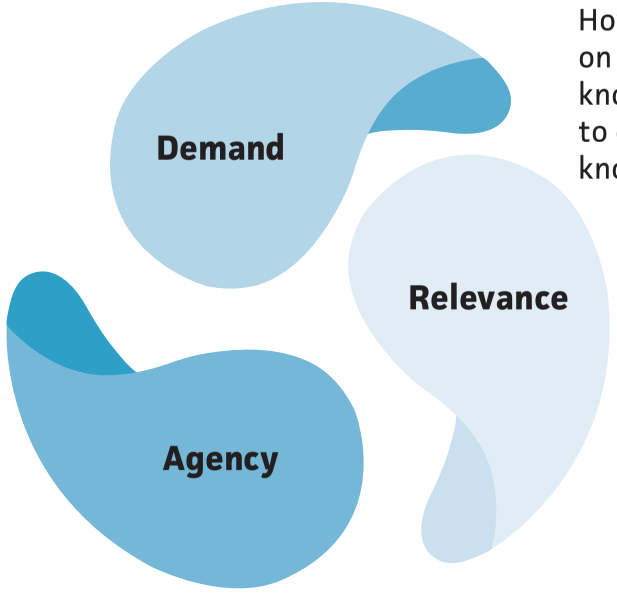
- Identify three actions for culturally relevant mathematics task building
- Explore mathematics tasks using a rubric for creating culturally relevant mathematics tasks

TASK-BUILDING ACTIONS

In Chapter 2 we ended with a list of features describing CRMTasks. In this chapter we will dive deeper into the teaching actions that are key to building such tasks. The work behind these features can be summarized into three actions for building CRMTasks (Figure 3.1):

- Establishing sufficient cognitive *demand* to harness student thinking and engagement
- Centering mathematics activity in/as cultural and community inquiry (*relevance*)
- Targeting empathy, *agency*, and social action as task prompts and outcomes

FIGURE 3.1 ● Culturally relevant mathematics task-building actions



Establish Demand and Access

How does the task focus on building deep conceptual knowledge and prompt children to do and create mathematical knowledge?

Center Community and Cultural Inquiry

How is the context and mathematical inquiry rooted in affirming and exploring cultural knowledges and identities? Does the task context and prompt feature empowered relationships, understandings about their community and themselves?

Target Empathy, Agency, and Social Action

How does the task prompt and context push students to respond to needs and issues with empathy, critical consciousness, and social action?

online resources To download this resource visit the *Engaging With Culturally Relevant Math Tasks (Elementary)* Free Resources tab on the Corwin website or visit **https://bit.ly/3Lgv22E**.

ESTABLISH DEMAND AND ACCESS

We see establishing demand as ensuring that all children are engaging in work that both highlights and strengthens their intellectual power in mathematics. Ladson-Billings (1994) refers to teaching as "mining," where teachers who practice CRP see—and treat—children as gifted knowledge makers. In mathematics, this requires building prompts and contexts around children's informal, cultural experiences, as well as their prior knowledge. A focus on cognitive demand allows task builders to consider the cognitive effort required to not only access knowledge but also grapple with rich mathematical ideas and necessary skills.

Comparing fractions is a good example topic to demonstrate cognitive demand in a task. Consider the problem below.

Compare the listed fractions by reasoning about their size. For example, you may use benchmark fractions, reasoning about the numerators and denominators, and fraction models. You may not use cross-multiplication. Tell which fraction is larger and explain why.

a. $\frac{3}{7}$ and $\frac{3}{5}$

b. $\frac{7}{8}$ and $\frac{6}{8}$

c. $\frac{4}{9}$ and $\frac{5}{8}$

This comparing fractions task requires more thinking than simply solving an equation because students must show their understanding of fractions and they must justify their response with an explanation. For problem a, students must show and/or explain that having the same numerator means you have the same number of pieces, and that comparing these fractions will depend on the denominator, which tells us the size of the pieces. Therefore, three larger pieces (fifths) is the larger fraction. A larger denominator has smaller pieces of the same whole. For problem b, students must show their understanding that the same denominator means the pieces are the same size; therefore, the fraction with the larger numerator is the larger fraction because there are more of the same-size pieces. Finally, for problem c, students can use a benchmark fraction like $\frac{1}{2}$ to compare the fractions because one of the fractions ($\frac{5}{8}$) is larger than one-half and the other fraction ($\frac{4}{9}$) is smaller than one-half.

The cognitive demand in this problem requires students to justify their answer so they are not only using a procedure without connecting it back to the mathematics concept. In practice, many students have the experience of comparing fractions by

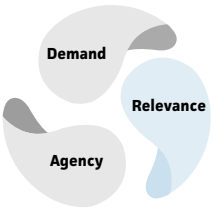
using the procedure of finding a common denominator to search for equivalent fractions. However, this is a very procedural exercise and does not involve much thinking or understanding of the relative size of the fractions.

We explained earlier that rigorous mathematical experiences are the floor for high-quality learning. Tasks with higher demands provide opportunities for students to make connections to prior knowledge and to their individual and community knowledge. See the following third-grade example:

> There are 5 bags with 3 bananas in each bag. How many bananas are there? Show a model of your solution using counters.

This task requires some degree of cognitive effort from students, and the solution can be represented in multiple ways (e.g., visual diagram, manipulatives, or equation showing repeated addition or multiplication). Students make connections between what they know from grade 2 about repeated addition to relate to creating multiplication equations with a set model/equal groups. Additionally, because the concept and model are introduced in a context, this helps students make connections to why the multiplication works. To strengthen the demand, we could revise the problem to be multistep and also make a stronger sociocultural connection to the students in our classrooms.

CENTER CULTURAL AND COMMUNITY INQUIRY



One of the most commonly missed opportunities in the mathematics activities of young children is in the way contexts are assumed as universal and culturally neutral. Consider, for example, the problem, "Mark has 5 marbles. Jeff gives him 7 more. How many marbles does Mark have?" The opportunity in this problem is to examine the notion of marble playing, as is common in many cultural traditions. The word problem asks children to think about addition without having to think about marble playing or activities associated with marble playing. For example, in Bermuda, Lou grew up playing a game of keeps, where children would exchange marbles when players were eliminated or trade preferred designs and sizes for shooting styles. Similarly, in Ghana, elementary children play a version of marbles where they shoot to get in, or closest to, a set of five shallow dirt holes arranged in a pattern of 2–1–2. A version of this game is also played in Bermuda.

One of the most commonly missed opportunities in the mathematics activities of young children is in the way contexts are assumed as universal and culturally neutral.

IMAGINE

Given the example of marble playing in Bermuda and Ghana (or elsewhere), as well as in any other similar cultural traditions, what inquiry questions around addition could be considered? How might you prepare to use a topic like marbles with the children and community you teach?

In the example on the previous page, the use of the word *marbles* itself is a cultural context. Indeed, all word problems and contexts carry hidden, assumed cultural ideas and values that are often placed on children and their teachers. The default for these experiences is to require thinking of mathematics that either totally ignores lived experiences, or worse, reflects realities that seem common to white children from affluent, cookie-cutter homes. This leads to missed opportunities to challenge and engage students.

The problems below illustrate more opportunities for cultural and community inquiry.

Problem 1.

Source: BrazilPhoto/iStock.com

Darren and René own a barbershop in their hometown. They are known to each cut around the same number of heads per day, except on Saturday they cut $1\frac{1}{2}$ times as many heads. Darren is the master barber and usually cuts 15 heads. René has a great following as well and cuts around 12 heads per day. Roger is an apprentice and cuts around 6 heads per day. When he is not cutting hair, he helps with sweeping and sanitizing the shop. If a haircut costs $30, how much does the barbershop take in on a daily basis? If the shop is open from Tuesday to Saturday, how much money is made in a week? How is this similar to or different from other barbershops you know about?

Problem 2.

Malik and Joel have created a volunteer project to mow the lawns of senior citizens in their neighborhood. In the first hour Malik mowed 5 of 8 rows of the lawn at one house, and Joel mowed 3 of 7 rows of the lawn at another house. How much of the two lawns have they mowed so far? What fraction of the two lawns still need to be mowed? How will Malik and Joel's partnership support the neighborhood?

Problem 3.

Shonda and her brother Gerald have been helping their father cook more at home, and they really enjoy being able to help. If they made a dish of rice and peas that used 1 tsp salt and a dish of stewed chicken that used 2 tsp salt, how much salt did they use for those two dishes?

In problem 1, we love how the context of Black barber-shopping (a phenomenon common in Black communities across the globe) is the root of mathematical inquiry in a way that affirms the experience as a thriving business opportunity. For children grounded in this experience, the context opens up the opportunity to explore cultural knowledge around Black barbers, experiences, and community. Consider also that last phrase where the doer is asked to think about other barbers they may or may not know about. Strong *sociocultural prompts* are important in bringing a "real" sense to the mathematics and pushing the mathematics conversation beyond trivial things.

IMAGINE

Create a different ending for the barbershop problem that features a strong sociocultural prompt.

In a different way, problem 2 models the community work of serving senior citizens, featuring how empowered relationships might look in a community. An interesting nuance of problem 3, the action of cooking (brother and sister working together to help their father cook) is a powerful counter-story of traditional identities and expectations. Each of these problems offers opportunities for children (and teachers) to inquire and learn.

IMAGINE

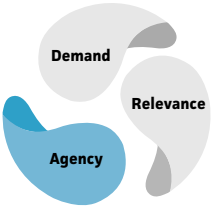
Consider similar word problems for your grade level that you have recently seen. Identify the cultural context and any prompts that are used to promote inquiry about culture (if any). Think deeply about the cultural intentions, or missed opportunities. What do you notice? How might you adapt?

Some problems in our mathematics textbooks and/or mathematics curriculum are well-meaning but provide very little cultural connections to our students. It is more common that we find these "naked" mathematics problems in practice. The challenge for many teachers is to revise tasks with meaningful cultural connections to our students. For example, consider the problem below:

Naked Fraction Problem: Add the fractions and show your work $\frac{5}{8}+1\frac{2}{3}=$ _____.

Cultural Context Problem: Yuki is making a traditional Japanese kimono for her daughter to wear for a special cultural ceremony. Her daughter's costume needs $\frac{5}{8}$ yard of fabric and Yuki's costume needs $1\frac{2}{3}$ yards of fabric. How much fabric will Yuki need? What might Yuki's dream design look like?

Including a cultural context provides opportunity for students to share similar experiences and for the teacher to promote inquiry about students' cultures.



TARGET AGENCY AND ACTION

By far, the most elusive feature of tasks we see in classrooms has to do with critical agency and consciousness. When we say *critical agency* we mean ways in which mathematics experiences require students to respond with empathy, stand in solidarity, explore social issues of justice, and take collective action in community.

AGENCY

Mathematics experiences that require students and teachers to engage in social issues of justice, respond with empathy, stand in solidarity, and take collective action *in* community.

The easiest way to think about problems that target empathy and agency is to reconsider the vast majority of the problems we see that don't. Take, for example, a grade 2 problem like this:

> Beth has a chest of coins where there are 531 gold coins and 123 silver coins. How many coins are there in the chest?

The problem involves gold and silver coins, and leads with the context that Beth is in possession of these coins. But the task only prompts the reader to calculate the number of coins. We see an avoidance of asking the kind of inquiry that has children think more realistically about money scenarios. These kinds of "magical" scenarios, while attempting to engage children, often trivialize the purposes of mathematics. In this way children often learn mathematics is not real—and when it is, it has nothing to do with them. Consider, on the other hand, a different version:

> This year Beth's neighborhood bicycle group received $243 in donations to build a bike park. If the class organizes a volunteer event to raise $331 more, how much money does the group now have? How much do you think would be needed to build a bike park in your neighborhood?

Children often learn mathematics is not real—and when it is, it has nothing to do with them.

IMAGINE

What are some additional experiences or constraints within the bike problem that could be explored?

What could have been a simple mathematics task of adding three-digit numbers is enhanced by the attention to the bike park and raising money, giving the problem personal and community relevance. Students are asked to empathize with the needs of Beth and her community, and to explore how a bike park might fit into their own local neighborhood plans.

RUBRIC FOR CREATING AND ASSESSING CRMTASKS

To help guide teachers as they were beginning to create CRMTasks, we created a rubric several years ago, first published in Matthews et al. (2013). The *CRCD mathematics task rubric* (see Figure 3.2) describes three dimensions through which tasks can be assessed. You will notice that each of the rubric dimensions correlate to one of the task-building actions we have been illustrating in this chapter. With the rubric, we want you to be able to analyze tasks you create, use, or adapt. We acknowledge here that we are talking about assessment long before we have gone into the nuts and bolts of planning. The emphasis is deliberate as good planning starts with a clear vision of successful outcomes.

The rubric is designed to help educators assess the richness of mathematics, and equally, the depth of cultural and community knowledge students access in any given task. The rubric has three big considerations for you as a designer. First, the rubric sets a condition that cognitive demand ought to be a baseline for tasks that challenge all students. It can also be seen as a filtering point for revising nonchallenging problems. Second, the rubric also suggests that the educator prioritize the statement, "Good mathematics problems are embedded in cultural and community inquiry and activity!" Thus, designers purposefully center community and culture (Relevance). Third, the rubric challenges us to consider the critical purposes for which mathematics might be defined and used. In other words, the rubric asks educators to assess the possible impact that completion of the task is expected to have on students' lives.

A few notes for using the rubric. We have repeatedly been asked the question, "Where should I begin?" The answer is simple: the design of CRMTasks can start in any dimension of the rubric. We have also seen in practice that the element of creating a task that provides opportunity to develop students' critical consciousness remains challenging for educators. That is, educators often remain reluctant to address social topics they deem too sensitive or disruptive of the status quo of school mathematics (as Eurocentric and culturally and politically neutral). This is a position we reject for several reasons. It doesn't represent the true history of mathematics contributions from various people groups. This position also ignores the very real lived experiences of many students and their ethnic groups and family; it paints a picture that the world of mathematics does not include them. Acknowledging the experiences of students, and their communities of culture and identity provides agency and voice for all children in

IMAGINE

Think of a few tasks you have created or assigned in the past and, based on feedback and reflective experience, analyze them using the rubric. What do you notice?

mathematics. Our hope is that the rubric offers a progression that helps teachers incorporate social justice issues and critical consciousness into mathematics tasks. We address helpful strategies for addressing this challenge in Chapter 6.

FIGURE 3.2 ● Culturally relevant and cognitively demanding mathematics task rubric

Requires considerable cognitive effort in mathematics

- ◇ Task is mathematically rich and cognitively demanding. It requires considerable effort using multiple representations and strategies to develop deep understanding of mathematics. Solution strategy is non-obvious.
- ◇ Task content draws from connections to other relevant subjects, disciplines, and concepts.

Emerging

Requires considerable cognitive effort

AND Embedded in Cultural Self-Community Inquiry and Activity

- ◇ The task is centered in real-world situations requiring students to inquire deeply about themselves, their communities, and the world about them.
- ◇ The task requires students to draw from, use, and embrace community and cultural knowledge directly in developing strategy and solution processes.
- ◇ Task content seeks to add to this knowledge through mathematical activity.

Developing

Requires considerable cognitive effort

Embedded in cultural inquiry and activity

AND Targets Cultural Self-Community Empowerment and Social Justice

- ◇ The task requires student examine structure and assumption of self, community, the world, and its relations in consideration of solutions and strategy limits.
- ◇ Task requires students to examine conditions of opportunity, justice, suffering, and inequity that arise in their communities, school, and the world around them.
- ◇ Task utilizes mathematical sense making and the solution processes to help students to develop informed perspectives and take action on real-world issues.

Exemplary

EMERGING DIMENSION

We use *Emerging* to categorize tasks that, at their basis, offer all students significant cognitive challenges. These tasks reflect high-quality features of problem solving and higher cognitive demand.

Consider the following task as Emerging. It is customary for mathematics textbooks to include problems where students have to find the area of a room to purchase carpet. We know that students don't purchase carpet; however, the context is at least reasonable that students can visualize a room with carpeting.

> Miss Kelly wants to purchase carpet for her new apartment. While shopping for carpet she sees one style that she likes for $2.50 per square foot. Her living room measures 15 ft by 18 ft. How much will the new carpet cost?

This problem has a high cognitive demand because it will require some degree of cognitive effort. Students must decide what to do with the information provided. Students would already know the difference between area and perimeter and they would also know that area can be found by multiplying side lengths or by adding using tiles. After they've established that this is a question of area, they can use the area formula to find the total area of the living room. For students who need a visual, they could model the dimensions to help them find the area. Knowledge of what a carpeted living room looks like can also help the students to connect the procedure to a context. Once the area is found, students will still need to use decimal multiplication to calculate the cost of the carpeting.

IMPROVE

Looking ahead a bit, what are some features of the Developing or Exemplary dimensions that are lacking in this problem? For example, how could aspects of cultural inquiry be incorporated?

DEVELOPING DIMENSION

We use *Developing* to illustrate tasks, products, and activities that require students to also engage in cultural and community self-exploration and affirmation. While these tasks represent some progress in design, they are still developing as culturally relevant because they do not "problematize" the status quo, nor do they offer critical inquiry into race, culture, inequality, and social justice.

Expanding on the area task above, we might add a context more relatable to students' experiences or a context embedded in aspects of their culture and/or community. In the next task, a student approached her teacher, Mr. Jelks, with an environmental concern about her school and the teacher used the student's inquiry as a basis for a mathematics task.

Dawn, who is a fourth-grader, does not like that her school uses Styrofoam™ lunch trays because they are bad for the environment and our health. Styrofoam is toxic and if disposed of improperly can get into our water sources. Animals also get sick when they eat pieces of Styrofoam. It is good that some cities have banned polystyrene foam in food service products. Unfortunately, her city has not. The Styrofoam trays are 10 inches x 14 inches. There are 200 students in Dawn's grade.

a. If the fourth graders replace the Styrofoam trays with compostable trays, how much toxic material can they save from going into landfills in a day?

b. If they recycle each tray with a refund of 5 cents per tray, how much refund will they receive each day?

(*Note:* Although Styrofoam materials are slow to degrade, they can be recycled properly.)

To align this task with the purposes of social justice and empowerment, Mr. Jelks could encourage the students to write a letter to the principal to ask her to ban these trays from the cafeteria. This moves to a more critical stance where students take an action and would elevate this task to the Exemplary dimension.

EXEMPLARY DIMENSION

We use *Exemplary* to distinguish tasks, products, and activities that feature personal and collective student agency, critical investigation, community solidarity, affirmation, and empowerment notions central to CRMTasks. Consider the following second-grade task:

Chelsea has started a charity where she collects art supplies and then creates art kits to donate to children who might need a reason to smile. She wants children to know that "art is a start to healing, expression, communication, and more!"

a. What 3 supplies would you put in the kits, and how many of each supply? In the chart, write the names of 3 art supplies and the number of each art supply in the kit.

ART SUPPLY	HOW MANY	CLASS TALLY	CLASS TOTAL
Total art supplies			

b. Why did you select these supplies? How might they help children in foster care and homeless shelters?

c. Make a class list of the art supplies every student chose. Tally the supplies. How many of each supply is there?

d. How many total supplies will the class donate?

e. To what organization will you donate the supplies?

For this Exemplary task we are asking students to learn more about helping others using the example of a real young girl who started her own charitable organization, Chelsea's Charity (https://www.chelseascharity.com/). Along with providing art kits, Chelsea is a budding artist herself and provides art lessons to children. She believes that the kits will help develop children's social, emotional, and mental health and well-being. There are many ways for young children to be contributors to the betterment of their neighbors, and many elementary students will be inspired by Chelsea's story. Some may even be motivated to start their own movements in their own way. At the same time, students can use mathematics to model the situation, tally the class materials, and add numbers up to 100. This multistep task requires considerable cognitive effort for young children, and it provides an opportunity for them to examine conditions of suffering that exist right in their own communities. It also empowers them to take action in a way that is suitable to their age and means.

By now the rubric has been used by hundreds of teachers to both revise existing mathematics tasks to be more culturally relevant and to create new CRMTasks by considering students' individual and community experiences. Our hope is that teachers continue to use the rubric to guide the overall depth of their task creation work.

When creating CRMTasks, we recognize that there are many ways to start the process. You can begin by thinking about important aspects of your own life and then recognize that your students would want the same thing. If you ask someone to choose photos from their cell phone photo gallery, you would most likely get photos of family, friends, pets, and other loved ones. These photos would probably involve the student and adult taking part in activities that are dear to them, activities that give them joy and pleasure. These activities might take place in their home, sometimes at school, on vacation, or visiting family and friends, as participants at events including sports, entertainment, and so on. With this in mind, when trying to create CRMTasks think about/learn about your students' home, heritage, hopes, and hobbies. Do a survey or a Community Walk

or provide opportunities for community members to share their **funds of knowledge** in your classroom (Foote et al., 2015). Current events should also be used as context, important landmarks, and community celebrations. We'll discuss all of these things in the next few chapters.

Summary and Discussion Questions

In this chapter we presented three task-building actions for CRMTasks: establishing demand; centering community and cultural inquiry; and targeting empathy, agency, and action. We also explored the *CRCD mathematics task rubric* (Figure 3.2), which includes three dimensions for creating and assessing CRMTasks. Having the goal in mind is a useful starting point for creating CRMTasks, and the rubric should assist with that, determining if you have an Emerging, Developing, or Exemplary task. We used *Emerging* to define tasks that challenge all students, based on the understanding and assertion that all students are capable of experiencing success. For the next dimension, we used *Developing* to define tasks, products, and activities that require students to also engage in cultural and community self-exploration and affirmation. Finally, we used *Exemplary* to define tasks, products, and activities that feature student action, critical investigation, community affirmation, and empowerment notions central to CRMTasks. Before we focus on the planning process for instructional design in the next chapter, consider the following discussion questions to reflect on the topics we just covered:

1. What are some resources that you have found useful for finding/adapting mathematical tasks that are cognitively demanding, immersed in cultural inquiry, and empowering? Find or create a list of five resources to recommend.
2. Look at a task you recently used in a lesson or plan to use in an upcoming lesson. List any nonstereotypical cultural connections you can mine from the problem context. In this chapter, we referred to critical agency as how the task prompt and context require students to respond with empathy, stand in solidarity, explore social issues of justice, and take action. What are ways this task can elicit critical agency?
3. The rubric presented in this chapter is designed to help educators assess the richness of the mathematics as well as the depth of cultural and community knowledge students access in any given task. Using the task from question 2 above, on what dimension of the rubric (Figure 3.2) did it initially start? How are you able to develop the task to the next dimension?

PART II

Practical Approaches for Planning and Creating Culturally Relevant Mathematics Tasks

In the next three chapters, we will describe and explore 13 practical approaches for planning and creating CRMTasks with hope and intention based on the foundational work of Chapters 1–3.

CHAPTER 4

Planning With Intention and Hope

In this chapter we will:

- Identify three practical approaches in planning the design of a CRMTask
- Analyze content standards and identify opportunities for culturally relevant mathematics experiences
- Use the "Hope Wheel" to generate mathematics tasks using "hope" verbs

"How [do] I usually plan? First, I look at the curriculum objective and I look for, you know, the resource, the [textbook] to match or correspond with that broad curriculum objective. They have several objectives to meet that curriculum objective and they break it out over a period of lessons, and I generally go lesson by lesson. Here, lately, I've been not as methodical in going or not as rigid in going through lesson by lesson by lesson."—A conversation with Tiffany, grade 3 teacher, 2001

Tiffany was at a crossroads in planning and had been trying out new, flexible ways of approaching lesson planning. She attended a "make mathematics meaningful" workshop one summer and was committed to breaking out of a cycle that included blindly covering objectives. Tiffany's story is not unlike others who feel the burden of needing to make sense of curricular objectives and expectations, and simultaneously concerned with engaging young children. In the next several chapters, we want you to unpack specific actions as you begin creating, adapting, and improving CRMTasks. This process starts at the planning stage, and as all teachers know, planning starts with intentional goals. We want teachers to think about

the goals behind tasks as a fundamental first step in creating a task. Goal setting for a given task or task set is one of the most important ways in which teachers can plan and account for mathematical experiences that will inspire and empower their students. In this chapter, we offer three practical approaches to help you in planning the intention and content of CRMTasks:

1. Analyzing standards for CRMTask possibilities
2. Adapting standards with hope verbs
3. Creating tasks from hope verbs

Goal setting for a given task or task set is one of the most important ways in which teachers can plan and account for mathematical experiences that will inspire and empower their students.

We will work through several examples to help you visualize what it looks like when you intentionally plan for tasks that foster Demand, Relevance, and Agency. We'll also explore how curriculum standards can be leveraged to foster high cognitive demand, cultural relevance, agency, and social justice through mathematics tasks. Finally, we'll share our new Hope Wheel, a verb generation model for focusing tasks with intention.

UNPACKING STANDARDS FOR CRMTASK-BUILDING OPPORTUNITIES

Unpacking and transforming curriculum standards represent real opportunities to plan for CRT. We see ways in which analyzing standards can help teachers emphasize and manifest critical moments for agency and inquiry. Another way to approach curriculum standards is to understand that not all standards are equal; some are more ideal for maximizing opportunities for CRT than are others. We want to highlight examples of these standards and examine features that directly and indirectly align to CRMTasks so that you are equipped to differentiate standards this way yourself. We also recognize that no educational environment is the same; teachers, curriculum planners, and coaches have varying levels of freedom within which they can create and use tasks in the context of larger standards.

Unpacking and transforming curriculum standards represent real opportunities to plan for CRT.

Most implemented mathematics activities in classrooms are driven by local, regional, and national "standards." The *CCSS*

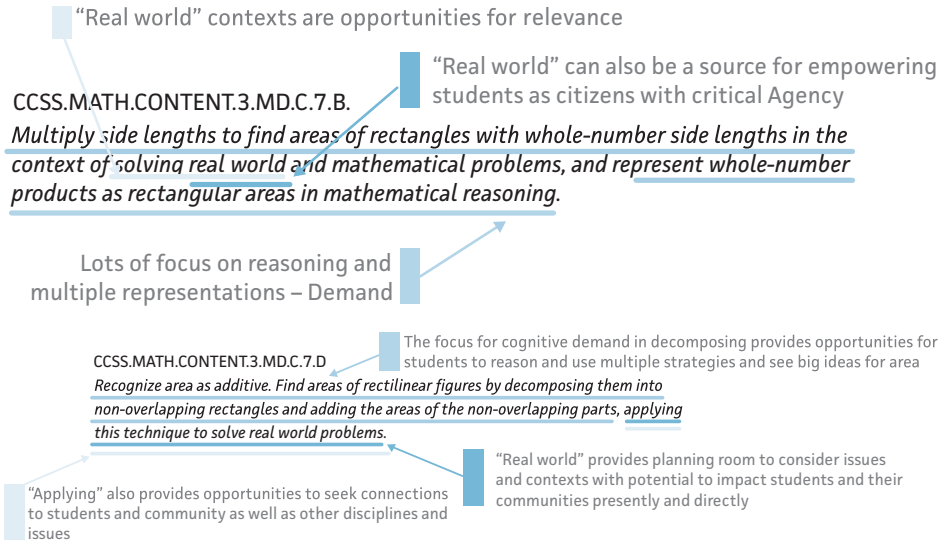
and *Texas Essential Knowledge and Skills* (TEKS) are examples of this. Rigid adherence to standards is often cited by educators as a major obstacle for creating and using CRMTasks. It might be helpful to reframe this obstacle as a question: Are there standards that naturally have greater utility for creating tasks of demand, relevance, and agency? We think so! Let's start by exploring sample standards and provide a brief analysis of how these standards fit.

Consider these two third-grade Common Core Standards:

> CCSS.MATH.CONTENT.3.MD.C.7.B.
>
> *Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real-world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.*
>
> CCSS.MATH.CONTENT.3.MD.C.7.D.
>
> *Recognize area as additive. Find areas of rectilinear figures by decomposing them into nonoverlapping rectangles and adding the areas of the nonoverlapping parts, applying this technique to solve real-world problems.*

In Figure 4.1, we see how these standards look when we correlate them with our model for task-building actions (Figure 4.1: = Demand, = Relevance, = Agency). This is how we can evaluate the potential of the standards as a basis for a CRMTask.

FIGURE 4.1 ● Potential task-building actions of third grade standards



In our analysis of the two standards, several points stand out. First, you will notice how both standards outline the kind of depth in student thinking about the mathematical concept of area required in the third grade, focusing on big ideas, multiple representations, problem solving, and applications. This scope of mathematics content and activity will be important in establishing demand for tasks.

Second, both standards ask students to solve "real-world" problems. "Real world" can be thought of as a code word for ensuring tasks are authentic and engaging. However, it's also a cliché, and we wish to push you beyond that. In thinking about the real world, there is opportunity in planning to consider relevant issues and contexts that students might directly identify with and be inspired by. Reframing it in this way allows for opportunities to create or adapt contexts that are local, known, and cherished by students.

The term *real world* also carries opportunities to focus on critical issues that potentially help students to exercise critical consciousness and responsiveness as citizens. We should note that many teachers feel hesitancy and sometimes outright reluctance in exploring student agency as "real world." If that describes you, this can be an opportunity to investigate your resistance and explore the choices you can make to better align your teaching methods with your intentions as a culturally minded and inclusive educator.

CREATE

Find a curriculum standard from your grade level like the ones previously mentioned. Create a "real-world" context that authentically reflects how mathematics is practiced in the "real world." Justify how the standard helps promote authentic inquiry and agency.

A common misconception is that real-world contexts are automatically and inherently culturally relevant. Real-world contexts are *only* culturally relevant if, and only if, they feature intentional cultural and community inquiry *and* if they target social agency and action. That is, a culturally relevant mathematics design requires deliberate, explicit attention to at least these two dimensions.

Real-world contexts are only *culturally relevant if, and only if, they feature intentional cultural and community inquiry* and *if they target social agency and action.*

Following are examples of two third-grade tasks that address the standards described.

CRMTask 1

Arlen loves visiting his grandmother's house and helping with her backyard. Today his grandmother Lillie asks Arlen to help her plan a rectangular patio in the yard. How many of the 1-foot square tiles (called pavers) will she need to make a small patio in the yard where she can relax? She tells him that the patio will be 6 feet long and 7 feet wide.

a. How many pavers (each 1 square foot) will Grandmother Lillie need for her patio?

b. What is the area of the patio?

c. If Grandmother Lillie has 60 square tiles, describe two different rectangular patios Arlen can create.

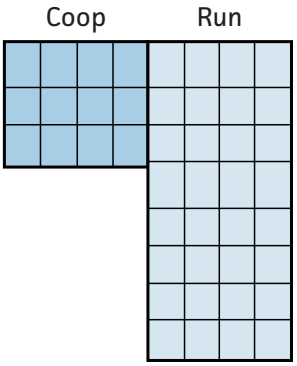
CRMTask 2

Source: Sabrina Bracher/iStock.com

Charlene's family moved to a rural town where they can raise chickens. She learned that she needs to have at least 3 square feet per chicken for her chicken coop. She also needs to have at least 8 square feet per chicken for them to "run" outside the coop. (See drawing of Charlene's chicken coop and run. 1 square = 1 square foot.)

a. Are Charlene's chicken coop and chicken run large enough for 4 chickens? How do you know?

b. How large is the total area needed for the chickens?



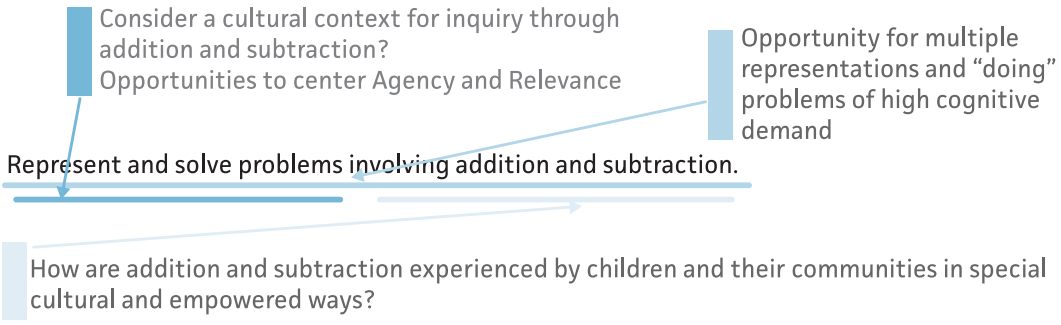
In the tasks just described, the real-life scenarios center around students' lived experiences. In conversations with her students, the teacher learns about students' day-to-day activities with their families. She uses that information to design mathematics tasks that mirror their experiences. Both tasks satisfy the Developing dimension as they require cognitive effort and they are embedded in students' real-world environment.

Now let's look at the grade 2 Common Core Standard on operations and algebraic thinking (Figure 4.2). Consider a deconstruction of this standard through the lens of the dimensions we have discussed thus far:

CCSS.MATH.CONTENT.2.OA.A.1.

Represent and solve problems involving addition and subtraction.

FIGURE 4.2 ● Potential task-building actions for a second-grade standard



The standard in Figure 4.2 is thin, but with some probing, it may possess opportunities for exploration of several of our dimensions for CRT. We have found two factors in particular that seem to be apparent within the elaborated standard. First, in crafting

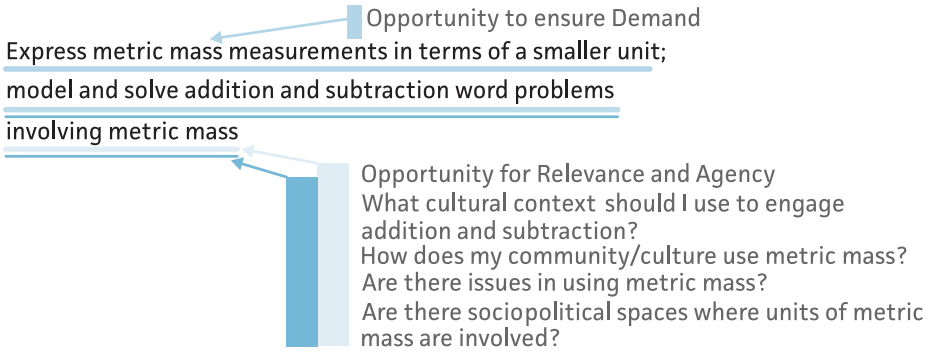
an instructional objective, teachers often grapple with selecting specific cultural contexts where cultural and sociopolitical inquiry might make sense in addition and subtraction. Second, the specificity typically found in a bounded curriculum often reduces context to trivial conditions.

At this point, one may be overwhelmed with decisions about content, appropriateness, and interest. The prework to the kind of design we are referring to involves building from (1) powerful student and family relationships, (2) deep knowledge about community and cultures, and (3) an empowerment view (vs. deficit) toward students and their communities. Think of this as a journey in which you can grow in competence with time and commitment. The practice of finding the opportunities in standards is an important emerging step in culturally relevant design and will undoubtedly improve with practice and earnest intention.

In the next example (Figure 4.3), we consider a grade 4 modular objective example from the Eureka curriculum:

> Express metric mass measurements in terms of a smaller unit; model and solve addition and subtraction word problems involving metric mass.
>
> *Source: engageny.org*

FIGURE 4.3 ● Potential task-building actions for a fourth-grade curriculum objective



IMAGINE

Choose a national/state or curriculum standard for geometry or measurement and analyze for opportunities for cultural relevance. How does the potential in this content area compare with others? What do you notice and wonder?

In this example, we take note that the task cognitively requires comparisons of units, modeling opportunities, and opportunity to solve problems. We can also see that there are possibilities in exploring various examples of tools or international contexts where the measure of metric mass might show up in communities different from ours (i.e., imperial measures). Comparing differences and familiarity with various cultural contexts may be possible (if not in context, certainly in teaching). Problems that depict how the metric mass measurements show up in everyday living definitely support our need

for intentional cultural and community inquiry. It is also important to challenge students with inquiry prompts and contexts that ask them to think about how personal decisions and circumstances revolve around the metric system and mass.

Through the examples we've given, you may see that the work of making standards come alive through thinking about culturally relevant task-building dimensions can be messy. What probably sticks out is that the default structure of standards seems to, at best, support cognitive demand with mathematics that is culturally "neutral." *Neutral* is a loaded word depicting contexts that default to the dominant culture. Even with "real-world" wording, there is intentional work to be done by the planner to relate and embed work around this standard as culturally relevant for their students. This is why so much of the best-intended curricula we see is not "neutral" but is actually culturally ignorant and reflective of huge missed opportunities. Something else that should stick out is the seemingly "messy" overlap of relevance and agency in some of our notes. This overlap makes sense when you understand that agency in mathematics can only be achieved in relation to connecting issues and challenges to what is local, cultural, and valued. One without the other results in a potentially inauthentic task context and almost always misses the point of embedding student culture and community.

ASK

What are some additional considerations for moving beyond neutral contexts and building demand, relevance, and agency into tasks?

PLANNING TASKS THAT FOSTER HOPE

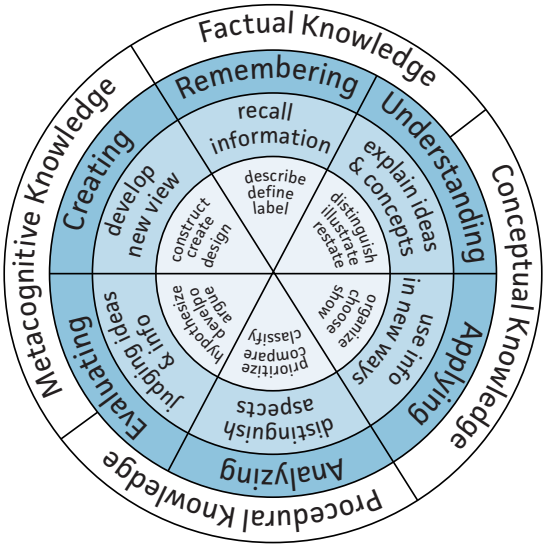
Reconstructing standards in the way we have outlined is not enough to build all tasks to lead to powerful, culturally affirming experiences. So far, what we discussed seems to work well in situations where planning conditions require strict or managed adherence to curriculum standards. But, increasingly in our work, we have been asked to help teachers and schools respond to important society and community "shifts" and events as they happen. In these situations, we must use our teaching to help respond positively in the moment to support students and their communities. In the following section, we will introduce the Hope Wheel, a planning tool for selecting goals to frame tasks in a positive and affirming way. We will also share examples of how we have used this tool in our work with teachers.

RESPONDING BEYOND BLOOM

An important role of schools of education and teacher education agencies is to help teachers *unpack* curriculum standards. A common approach is to use Bloom's taxonomy as the standard for creating instructional objectives and to apply cognitive

science research of developmental progressions on how children learn mathematics. While this is helpful (e.g., knowing when a child's brain is developed enough to understand the concept of place value), planning for CRMT requires a deeper dive beyond Bloom's progressions and standards.

FIGURE 4.4 ● Bloom's taxonomy revised for 21st century learners (Center for Teaching & Learning Excellence, The University of Utah)



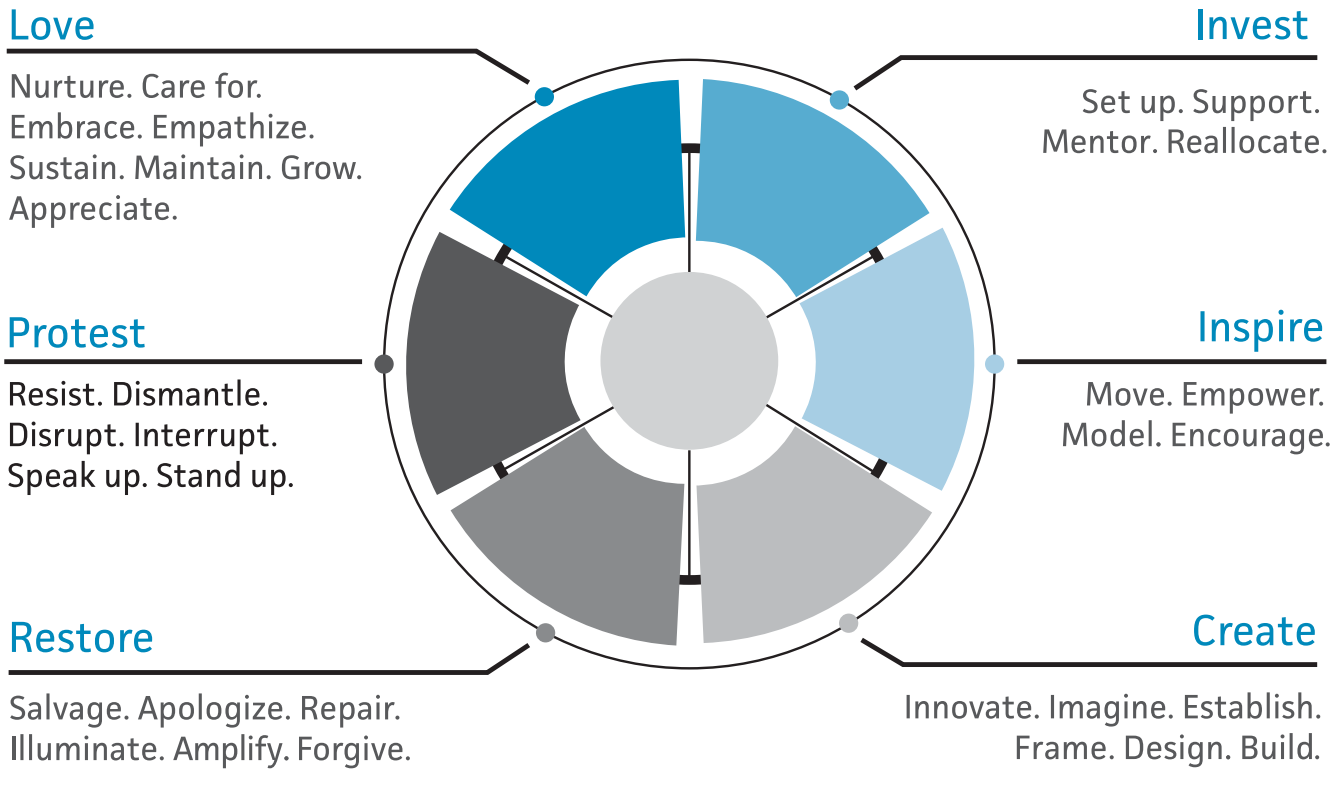
Source: Center for Teaching & Learning Excellence - The University of Utah. Wheel adapted from Edutechnology.

As a refresher, Bloom's taxonomy orders six verbs of learning (Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating) from recalling information (at the most basic level) to developing new ideas (at the most complex level). Although we see understanding as being multifaceted and more complex than a linear progression (a great exploration of the Six Facets of Understanding is found in the book *Understanding by Design*, by Wiggins & McTighe, 2005), we also believe that planning CRT for today's classroom means moving beyond the often spiritless frames of these classifications into a view that is more holistic and humanizing.

RESPONDING WITH HOPE

The Hope Wheel was created by Dr. Lou Edward Matthews in 2019, with the intention of supporting educators and leaders with new ways of crafting lesson learning sessions to respond to racial and social injustice, as well as social crises. The Hope Wheel (Figure 4.5) is composed of six social response verbs: *Love*, *Protest*, *Restore*, *Invest*, *Inspire*, and *Create*. The verbs were drawn from themes based on the notion of "strong Black community," which includes ways to draw from and build on community wealth,

FIGURE 4.5 ● The Hope Wheel



Source: Created by Lou Matthews, 2020.

online resources To view and download a full-color version of the Hope Wheel©, please visit **www.loumatthews.live/hopewheel**

community health and safety, community wisdom, community love, collective power, and justice (see Matthews, 2018).

In the same way that Bloom's taxonomy has provided verbs that teachers can use in their tasks to prompt students to think at various levels, the Hope Wheel provides teachers with verbs that can be used to plan for CRMTask experiences for their students.

The Hope Wheel helps us create what we see as "hope" standards—goals and objectives reimagined for justice and cultural inquiry. With these verb categories, we want teachers to extend the process of unpacking standards and using them to design task goals. Using this information, teachers can select, adapt, and modify standards and intentions as part of the creation process.

ADAPTING CONTENT STANDARDS WITH HOPE VERBS

One approach is to select an existing content standard and then use the Hope Wheel to sharpen the focus and build out a context for relevance and agency (remember, standards are often vague in this regard). Below is an example of this approach in action, using a fourth-grade state standard.

> *TEKS Grade 4.13:*
>
> *The student solves problems by collecting, organizing, displaying, and interpreting sets of data. The student is expected to interpret bar graphs.*

The standard above requires students to solve problems using the statistical thinking process. So much of the statistical thinking process involves using data to make decisions about resources. When we think of CRT, we envision how students in community can be empowered to use mathematics as they stand up for the rights of people. Using the Hope Wheel we can choose the *stand up* verb to sharpen this focus even further. Below is a "hope" standard we created by adapting the original:

> We will stand up *for improved voter booth distribution in a local neighborhood of the students' choice, create a bar graph from the city's latest report on voting booth distribution, and prepare a presentation. In their presentation, students will demonstrate an analysis of the graph's content.*

ASK

Choose a content standard from your grade level. Use a protest verb to adapt it.

As you can see, this example shows how cognitively demanding mathematics tasks can be framed so that they ask students to interact with their community in a meaningful way and empower them to take action (Protest). Also note in the example how we reframe the conversation as "We will" to denote the solidarity of the teacher with the students.

Let's take a look at adapting another content standard.

CCSS.MATH.CONTENT.1.NBT.B.3.

Compare two 2-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.

This is a very important concept for first-grade students to learn. Students might use a variety of strategies to compare the numbers including using a 100-chart, 10 frames, number lines, and base 10 blocks, to name a few. Using the hope verb *Restore*, we can adapt the standard to provide opportunity for students to learn another important skill: how to forgive and restore harm done to classmates when things are done that are unfair.

Over three days, students will keep a class tally of fair and unfair episodes that happen in school (in class, at lunch and during recess, and/or specials). Each day the class will count their tally marks and write a number sentence to compare the fair versus unfair episodes. After three days, students will discuss how to forgive students or teachers who may have been unfair, and they will write a list of actions to restore the harm done to classmates.

ASK

Choose another standard and a different hope verb. Adapt the standard using that verb. Remember, it is not necessary to use the actual verb in the new learning objective. It is the intention that matters.

CREATING TASK GOALS FROM HOPE VERBS

Another effective way to use the Hope Wheel is to create or adapt tasks directly. That is, rather than starting with a content standard as the foundation, teachers can follow a process that starts with the Hope Wheel itself: (1) choose a hope verb to set the intention of the task, (2) create a context that illuminates that verb, and (3) choose mathematics content to embed within this context. Note that aligning with a content standard is not always possible and may not always be a priority. We have seen teachers use the Wheel in ways that envision mathematics classroom environments beyond content. We love this!

Consider Vignette 8.

VIGNETTE 8

Mr. Shah asked students to take photos of mathematics in their homes and communities during the coronavirus pandemic. Students shared their photos, telling stories of their community artifact and how it connected to mathematics. Mr. Shah then created mathematics tasks using Hope Wheel verbs and connecting the story/artifact to Common Core Content Standards. The stories/artifacts allowed his students to learn about one another and the stories made them personally engaged in the tasks.

TRY THIS!

1. Choose a hope verb
2. Then generate a relevant context
3. Finally, choose mathematics content and embed

Taking the stories from his students, Mr. Shah used Hope Wheel verbs to create mathematics tasks. See the examples below:

Source: Tomwang112 /iStock.com

1. Aiden brought in a photo of his grandfather's vegetable garden. Mr. Shah chose the Hope Wheel verb *Love* because Aiden spoke with love when he told the class about how neat his grandfather kept the garden and how he liked helping his grandfather tend the garden. Mr. Shah created the following task:

   a. It is clear from the photo that there are five rows of tomato plants. Aiden says he counted about 30 tomato plants. How many tomato plants are in each row?

   b. How does a family garden contribute to the household?

   c. In addition to growing tomatoes, Aiden's grandfather also has carrots in his garden. What favorite dish can Aiden and his grandfather cook with these vegetables?

   d. The Common Core Content Standard Mr. Shah chose was 3.OA.A.4—Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

2. Eva's photo of her fireplace at home made Mr. Shah think about the different shapes we see all around us. When Eva spoke about the mathematics of the fireplace, she said the bricks created a pattern. Mr. Shah thought about the *Create* verb to have his students use their own creativity to design a pattern of their choice.

   The task: You are a designer and your neighbor asked you to create an interesting design for his new floor. If someone asked you to describe the design, what would you say are the attributes of your design?

Although Mr. Shah didn't readily find a Common Core Standard to "fit" this task, he knows that some students will undoubtedly choose geometric terms to describe the attributes of their design. He plans to use that vocabulary to jump-start a lesson on

the following Common Core Standard on reasoning with shapes and their attributes.

CCSS.MATH.CONTENT.3.G.A.1.

Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

Another example of using the Hope Wheel is to start with a common occurrence in school or the community, choose a verb from the Wheel, and create a mathematics task appropriate for your grade level. We started with the scenario of a student who never eats in the cafeteria because they don't serve food that she likes. We created the following task in response to Belén's problem using the verb *Protest*.

Belén is a student in Ms. Allen's class. The cafeteria at school doesn't serve any food she likes. She wants to find out what her classmates think, so she took a survey of their favorite foods in the cafeteria and tallied the following results shown in the table.

FOOD	TALLY	COUNT
Pizza	𝍸 𝍸 ||	
Spaghetti with sauce	||	
Chicken nuggets	𝍸	
Hot dog	𝍸 ||	
Pancakes with syrup	||||	
PB & J sandwich	||	

a. Belén wants to use this survey to convince the school to switch one of the foods for her favorite food, a torta. A torta is a Mexican sandwich. Which food should the cafeteria switch for a torta? Explain why you would switch a torta with one food in the table.

b. Make a bar graph showing your new results. Use a title, labels, and a scale to count by ones.

No curriculum, standards, or wording will lead to the automatic creation of CRT without powerful new thinking about the nature of mathematics, who it is for, and what it can be used for. We believe that the Hope Wheel provides for such thinking. What should be taken from our use of the Hope Wheel and our deconstructing of content standards is that planning work for CRMTasks begins with careful and deliberate attention.

No curriculum, standards, or wording will lead to the automatic creation of CRT without powerful new thinking about the nature of mathematics, who it is for, and what it can be used for.

Summary and Discussion Questions

We stated in our introduction to this chapter that planning begins with intentional goals, and then explored how to analyze a local, state, or national content standard to find opportunities for CRMTasks. We later emphasized that this planning involves building from (1) powerful student and family relationships, (2) deep knowledge about community and cultures, and (3) an empowerment (vs. deficit) stance toward students and their communities. We ended the chapter with an introduction to the Hope Wheel, which, like Bloom's taxonomy, can be used to further adapt standards, using hope verbs to frame tasks in a positive and affirming way. In our next chapter, we will look at creating contexts for cultural inquiry. Before moving on, use the questions below to consider how you can use the tools and ideas presented in this chapter.

1. As you begin to put into practice the ideas presented in this book, consider the following questions when planning a CRMTask for your classroom. What are your *intentional* goals for your task as it relates to *relevance* and *agency*? How is it based on an empowerment stance?
2. What experience do you want your students to have as a result of being engaged in the task, beyond the mathematics?
3. What verb from the Hope Wheel best describes your intent, and why?
4. As stated in this chapter, the term *real world* carries opportunities to focus on critical issues that potentially help students to exercise critical consciousness and responsiveness as citizens. What are some adjustments you need to make to your teaching methods to align with this focus?

CHAPTER 5

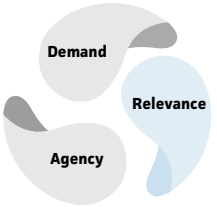
Creating Contexts for Cultural Inquiry

In this chapter we will explore creating contexts for cultural inquiry. We will:

- Use a cultural inquiry process to emphasize caring and belonging
- Explore student interviews to build cultural contexts
- Explore Community Walks to build cultural knowledge for contexts
- Explore using children's literature to build from cultural knowledge
- Explore using cultural artifacts as a source of mathematical knowledge

It was not uncommon in later observations of Marie's class to see a mix of both traditional and nontraditional approaches to teaching, but in these early observations this was not the case—her method of teaching was predominantly traditional and strictly tied to the text. This meant there was usually very little room for exploration of students' ideas and strategies. She would later tell me that as her comfort level increased so did her ability to incorporate students' perspectives into the lesson. . . . Marie shifted focus as she began "connecting" by using an illustration that she believed to be familiar to the students, customs duty and the importation of goods into Bermuda.

—Matthews (2003, p. 75)



This conversation with Marie illustrates a journey of "letting go" of the reliance on cookie-cutter ideas to "let in" the world of the student. In the previous chapter, we saw that standards typically provide attention to cognitive demand but offer little or vague support for creating contexts that prompt students to inquire deeply about what's valued and loved in their communities. Cognitive demand should not be the sole or privileged measure of rigor. Here, we pause and challenge you to consider how the words *rigor* and *challenge* are often synonymous but used without cultural ways of knowing. We advocate for centering relevance (task-building action 2) as a part of your design skills. This is as much a matter of the heart as it is of the head. In this chapter, we give deliberate attention to inquiring about the cultural brilliance and wisdom of children and their communities. We focus on this inquiry as the central source of mathematics activity by exploring five approaches to building authentic contexts for tasks. We'll discuss what each approach means and explore examples where it is applied to build inquiry contexts.

Cognitive demand should not be the sole or privileged measure of rigor.

EMPHASIZING WE CARE/WE BELONG TO CREATE CULTURAL INQUIRY

One of the simplest ways to think about cultural inquiry–based approaches is to reflect on a common model given to teachers for promoting inquiry with young learners. Cultural inquiry draws from inquiry-based learning, which actively positions students at the center of the learning process. In elementary classrooms everywhere, familiar posters of "I notice, I think, I wonder" are hung in an effort to prompt both students and teachers to open up their thinking routines to inquiry.

I notice...

I think...

I wonder...

Source: EasyBuy4u /iStock.com

In the inquiry process, students are given a sufficiently open-ended problem and asked "what do you notice?" to launch their thinking about mathematical ideas. As they process and strategize, it is helpful to encourage them to communicate their noticings/wonderings. You can see this in the following task launch excerpt taken from a popular elementary curriculum module:

> Teacher: [Call students to sit in a circle on the carpet.] "I was looking at my pencil box this morning, and I was very curious about how long it might be. I also have this handful of centimeter cubes, and I thought I might be able to measure the length of my pencil box with these cubes. Does anyone have an idea about how I might do that?"
>
> (EngageNY Grade 2 Module 2 Lesson 1, p. 10)

Notice the elements of inquiry as the teacher prepares for students to notice the cubes, the vocabulary, the pencil box context, and the problem scenario. The task of having students guess how centimeter cubes might be used to depict length is open enough to generate student creativity, curiosity, and analysis.

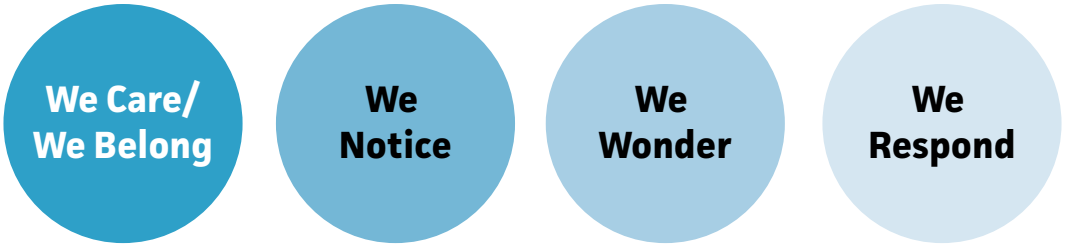
Consider a different problem that is less intentional in terms of inquiry, but a good example of having sufficient challenge for noticing and wondering. This task prompts students to think about the concept of recurrent earnings in a way that might relate the problem to class life, and then asks them to write an equation to represent the situation.

> The Parkers organize a family trip to the Black Cowboy Museum. The cost of the road trip including gas, accommodation, and food is $975. The Parkers agreed that their two daughters would raise half of the funds for the trip that is six weeks away by braiding hair and walking dogs.
>
> - How long would the girls take to raise the money based on the money they could make from the activities? Present as many options as possible based on your neighborhood and skills.
> - Write an equation to represent this situation.

In the two examples above, both context and prompts require students to notice and wonder. But we wish to push on your expectations for inquiry even further. We can extend the inquiry process by asking: Why should we care? How are we connected to the context? In doing this inquiry, are we able to respond and connect to our community and each other?

In Figure 5.1, we revisit the inquiry process with the emphasis on prioritizing cultural inquiry as a "we" endeavor ("we" = teachers, students, and community). The "we" is used intentionally and forces a repositioning for teachers in how they see both community and culture. It requires us to ask first: "How do I feel about the *people* in front of me?", "How am I to show up in their community?", "What does the community care about?", and "What values and aspirations are apparent in this community?" A trivial or incomplete approach to asking questions of caring would focus solely on students and might only lead teachers to brainstorm a list of individual student interests, but considering student interests alone does not accomplish CRT.

FIGURE 5.1 ● Approaching cultural inquiry from a "we" perspective



A trivial or incomplete approach to asking questions of caring would focus solely on students and might only lead teachers to brainstorm a list of individual student interests, but considering student interests alone does not accomplish CRT.

We can expand our understanding of the "we" focus of cultural inquiry by considering the list of context design questions and examples in Figure 5.2.

FIGURE 5.2 ● Questions for cultural inquiry

INQUIRY ELEMENT	DESIGN QUESTIONS WE ASK FOR CULTURAL INQUIRY
We Care/We Belong	How does this context and prompt affirm how children and teachers belong and identify as part of their collective (as well as individuals)?
We Notice	How might this task focus and highlight powerful aspects of community/culture?
We Wonder	How can this task deepen how we understand ourselves, our culture, the community, and the world around us? How does this task focus on how our culture/community is valued and respected?
We Respond	How can this task model care, love, and respect for our community and culture? How can this task draw from and illuminate the beauty and wisdom of my students, our community, and culture in ways that have been hidden or ignored?

In focusing on "We Care/We Belong," we are intentional about using words of care and affirmation while rejecting deficit views and incorrect or harmful ideas about who children are and what their communities value. For example, Mrs. Wagner learned from her students that they value the time they spend with their families. One student in particular was very excited to tell her about spending time with her grandparents every year during their annual family reunion. Mrs. Wagner decided to use this information in the following problem instead of her original idea of going on a camping trip, which is something she does with her family but which she discovered is not an experience many of her students share or value.

Nia is excited to travel to Virginia to participate in her annual family reunion. There are 58 family members in attendance this year, including her grandparents who are elders of the larger Blackwell family. Use this table to calculate the average age of the family members in attendance.

FAMILY AGE RANGES	INDIVIDUAL AGES
Children 0–10	1, 3, 5, 6, 6, 8, 8, 9, 9, 10, 10
Teens 11–18	11, 11, 11, 12, 13, 14, 14, 15, 16, 18, 18
Young Adults 19–29	19, 20, 21, 25, 26, 27, 28, 28, 29
Adults 30–59	30, 32, 34, 39, 40, 40, 40, 46, 50, 52, 55, 55
Seniors 60–79	61, 62, 63, 65, 65, 68, 70, 73, 74, 75, 78, 78
Elders 80+	82, 83, 86

In focusing on "We Care/We Belong," we are intentional about using words of care and affirmation while rejecting deficit views and incorrect or harmful ideas about who children are and what their communities value.

CONDUCTING STUDENT INTERVIEWS TO BUILD FROM STUDENT CULTURE

In the following section, we share examples of how this work of building from culture might occur. In one of our courses, we asked a group of teacher candidates (TCs) to reflect on ideas about how they would write CRMTasks and lessons. The TCs had been learning about CRP, and to put their new knowledge into practice, they participated in an activity to learn more

about an individual student. The goal was to have them consider how they would use the information about the student in a mathematics lesson.

"Getting to Know You" Student Interview

[Shortened and modified from Foote et al. (2015) Mathematics Learning Case Study Module]

Overview of Assignment

There are several purposes of this interview. The first is to find out more about the student, including student interests, activities the student engages in outside of school, and what the student identifies as activities at which they excel. You might find out, for example, what kind of activities the student engages in in the community with their friends and family (e.g., does the student play soccer at a local park, does the student go to a community center, where does the student shop, etc.). The second goal is to identify places, locations, and activities in the community that are familiar to the student, and to find out what they know about potential mathematical activity in those settings. These could include locations in the neighborhood immediately surrounding the school (e.g., places that are more or less in walking distance), locations/settings in the neighborhood in which the student lives (if that differs from the community surrounding the school), as well as locations/settings in the broader community with which the student is familiar. A third purpose is to find out more about the students' ideas, attitudes, and/or dispositions toward mathematics.

Conducting the Interview

Select one student from your practicum classroom who is different from you in one or more sociocultural ways (e.g., race, socioeconomic status, home language; do not select only on the basis of difference in gender) and who seems to you to struggle at least somewhat with mathematics. Conduct an interview with this student and in a one-page reflection introduce your student, explain why you selected this student, tell what you learned about the student, and present your ideas of how you can use the information you learned about the student to plan a mathematics lesson.

ASK

What was your first experience learning about culturally relevant teaching? When did you first experience culturally relevant teaching for yourself? Describe the experience.

In preparing these new teachers to write a culturally relevant lesson, in addition to conducting the student interviews, they also read scholarly articles on CRP and teaching mathematics for social justice. Many of them reported that the readings were the first time they heard of these topics. Prior to these readings, the teachers recognized that they needed to take student interest into consideration when writing lessons; however, they were unaware that culture could—and should—play a part.

The quality of lesson ideas that resulted from the student interviews varied greatly in terms of the teacher's ability to and/or comfort with incorporating cultural referents into a mathematics lesson. Some teachers focused on superficial factors

they learned about the elementary school student, while other teachers learned detailed information about the student to incorporate into a mathematics lesson. Vignette 9 is one teacher's reflection on how they could incorporate information about a student into a mathematics lesson.

VIGNETTE 9: GETTING TO KNOW A JAMAICAN AMERICAN STUDENT (ALL NAMES ARE PSEUDONYMS)

The student that I interviewed was such a joy to converse with. His name was Brandon and he is in third grade. He is Jamaican and comes from a very hardworking family. His mother is a nurse for the elderly, while his father works in insurance. I selected this student because he is so intelligent for his age and always carries himself in such a humble way. I am his aftercare teacher, so I see him multiple times a week. There are many comparisons between Brandon and myself; for starters, we are each of a different race. I am a Caucasian American female while he is a Jamaican American male. His father has a Jamaican accent, whereas mine does not. Also, I am more than double his age. Other than that our family background seems to be pretty similar. For example, my mother is also an insurance claim adjuster like his father.

I learned from Brandon that he loves to play with cars and play on the playscape in his backyard. He is very active and enjoys always being on his feet and moving around. His disposition toward mathematics is that he finds it challenging at times. His father and mother both aren't strong in mathematics either, so when it comes to homework time, it can be challenging for Brandon to get help and answers from them. During class time, his teacher makes it fun and engaging to learn mathematics. He says the only challenge is when he is alone doing mathematics and stumbles on problems he can't solve without guidance.

Source: FG Trade/iStock.com

I can use the information that Brandon provided me to plan a mathematics lesson through understanding his need for extra help and also guiding him through words of encouragement. Brandon is able to succeed better with mathematics when he is receiving one-on-one help versus classroom mathematics times when other students are asking for help as well. Even though his teacher engages him and helps him when needed, I still would provide and find the time to have one-on-one conferences with him. This way, I can gauge the area of mathematics he thrives in versus struggles with, so he can learn, progress, and succeed.

REFLECT

What did you learn about Brandon that could be used to plan a lesson from an asset-based perspective and that builds from the student's culture?

In Vignette 9, the teacher plans to use the information she learned about the student to support him in learning mathematics. Although the teacher is being thoughtful about the student's needs, she is planning a lesson from a deficit perspective. Her focus is on what the student does not know.

In Vignette 10 another teacher writes about how they plan to use the information to create a lesson by utilizing community and cultural knowledge.

VIGNETTE 10: GETTING TO KNOW A STUDENT WHOSE FAMILY OWNS A LOCAL BUSINESS (ALL NAMES ARE PSEUDONYMS)

I interviewed a nine-year-old male student in fifth grade named Ibram. He is Syrian and Muslim, which is very different from me because I am Puerto Rican and Catholic. He speaks Arabic at home and I only speak English at home. Ibram has three sisters and one brother, but they are all much older than him. His brother is closest in age to him and they are 10 years apart! I grew up with one sister and we are 2.5 years apart. I found this student because he is my friend's little brother and I realized he would be the perfect person to interview because we are so different. This student lives in Bridgewater, where I grew up as well, but we live in very different areas of Bridgewater, so our experiences are still different.

I learned that Ibram likes to cook, play with Lego®, read, and do karate in his spare time. I don't have an interest in any of these things, which continues to show me how different we are. The one thing that we have in common, besides living in Bridgewater, is that our favorite subject is mathematics. Ibram's family owns a few gas stations in Bridgewater, so mathematics is a big part of his life. He likes to help his parents and siblings at the cash register doing mathematics. He is very aware that mathematics is all around us because his family has to do mathematics on a daily basis. It was clear while talking to him that he only thinks about money when thinking about real-world mathematics. When I asked about mathematics in school, he only mentioned the four operations—addition, subtraction, multiplication, and division. This makes me think that he thinks these are the only aspects of mathematics. Ibram feels very confident with his mathematics work, but he struggles with long division.

Using the information I learned about Ibram, I would create a long division lesson. Ibram doesn't really struggle in mathematics, but long division was the one thing he said he didn't enjoy. I feel it is important for students to see themselves represented in mathematics, so I would review the steps to long division and then do word problems with the students that relate to Ibram's life. Every student gets excited to see themselves in word problems, and it makes them more dedicated to solving them. There are plenty of word problems I could create using common issues in a gas station. I could create a problem with money because that is what Ibram seemed to be most familiar with.

REFLECT

Compare Vignettes 9 and 10. How are their approaches to using student interview information similar/different? What recommendations would you provide to each teacher?

Going back to Brandon, the Jamaican American student highlighted in Vignette 9, you were asked to consider planning a lesson from an asset-based perspective. Did you consider that his mother is a nurse and his father is an insurance adjuster? Both jobs require mathematical thinking. Whether or not this "mathematics" is done on paper like in school, you could use information from nursing like medicine doses and information from insurance like basic statistics. The idea is to empower the student by "noticing" how his mother and father might actually be quite smart in mathematics but may not be familiar with how we are thinking about mathematics in today's classroom. The student could be encouraged to ask his parents how they might use mathematics, and he could show them how he does mathematics. This goes back to the "We Notice" question of how a task can highlight powerful aspects of a student's community/family.

The teacher in Vignette 10 did a better job than the teacher in Vignette 9 at connecting to the student's community/culture, particularly with regard to his family. Starting with information about the student's family business was a great way to reinforce the student's already positive mathematics identity. One thing we would recommend for this teacher is to help the student understand that what he does with his family is mathematics and what he does in the classroom is also mathematics, so that the student doesn't see these as separate ideas. This would also help him to see that mathematics is about more than just money. When not asked to do so, it seems that neither of these teachers thought to include critical aspects of community life or local issues (recall task-building action 3—agency).

Other information that teachers used from student interviews included sports (e.g., basketball, football, gymnastics, soccer), video games and toys (e.g., Fortnite©, Lego blocks, superheroes, etc.), creative arts (e.g., drawing, singing, dancing), outside activities (e.g., trampoline park, playing tag with siblings and friends), reading, playing with animals, and other student interests. We should be reminded here that focusing on students' interests alone does not accomplish CRT; however, it is a starting point for these TCs.

CONDUCTING COMMUNITY WALKS TO BUILD COMMUNITY KNOWLEDGE

Another assignment to assist teachers in learning about their students is a Community Walk, which is a highly effective

strategy for building from community and cultural knowledge and wisdom. We talked about this briefly in Chapter 1 and offered the Community Walk Checklist (Figure 1.3) as a tool to help you notice the differences and similarities between your school's community and the one in which you may live. We will now dive deeper into the rich possibilities of conducting a Community Walk.

An important activity for CRMT is *designing mathematics contexts, prompts, and inquiry from culture and community sources*. The Community Walk assignment is a great way to move beyond learning about students' interests and connect learning to a more meaningful understanding of their lived experiences. Exploring community funds of knowledge also provides greater opportunity to address the critical aspect of CRP in mathematics lessons. The instructions for the assignment can be seen below.

Community Walk Assignment

1. Visit one or more locations in the community surrounding your school. It is important that you are willing to walk off of the school grounds. Select locations that are familiar to students (e.g., places that draw families in the community, social hubs).
2. During your visit, look for and document evidence of mathematics. If possible, talk to individuals who work/play/shop in the setting about how they use mathematics. Take/draw pictures and field notes. Identify how each picture or experience you document provides evidence of mathematics. During your visit, refrain from making judgments about the neighborhood. The goal of the Community Walk is to learn from the community and identify resources for future lesson planning. It is also a time for you to confront stereotypes or assumptions you may have.
3. If you have the opportunity, show students from your field site your photographs and have them tell you what they know about these places and, if relevant, what they (or their family) do at these places (especially if it involves mathematics). You will be amazed at how much more they will share with your photos in hand!

Teachers were given this assignment in an effort for them to both connect to their students' community and learn about the various ways mathematics is used in the community. This is to help students see that mathematics is all around them and that people in their community are doers of mathematics. Below are examples of two Community Walks conducted by teachers and their different responses to the visits.

VIGNETTE 11: COMMUNITY WALK IN LITTLE POLAND (ALL NAMES ARE PSEUDONYMS)

I explored an area of town called Little Poland. Within this area are many Polish restaurants and shops. One of the most well-known restaurants in this area is Star Restaurant, which is known for its authentic Polish food, especially its pierogies. Also, you can find the Syrena Bakery, which sells traditional Polish food ranging from bread to pierogies. In the heart of Little Poland is Sacred Heart Parish, a Polish American Roman Catholic Church. While exploring the area, I noticed a lot of signs and advertisements written in Polish. It amazed me that within only a six-minute drive from my house I would find this much culture that I didn't know existed. This experience also made me think back to my time working at the local elementary school. I did not realize there was such a strong Polish heritage in my new city. I wish I knew before so I could have been more aware of what backgrounds were in my classroom.

To engage my students in learning about Little Poland, I would create a culturally relevant mathematics lesson related to currency. The lesson would begin by having my students go shopping at the bakery to buy some authentic Polish food. The students would be told how much money they have to spend, but using American currency. The prices for the food at the Syrena Bakery would be in the zloty, the currency used in Poland. Students would need to determine what they could buy using the American dollar. Students would know that 1 Poland zloty is equal to 27 cents. Students would practice converting money with their multiplication and division skills. Through this activity, students will also get the chance to become more aware of Polish food and culture!

IMPROVE

Vignette 11 is a great first try at accessing cultural knowledge and wisdom. What could you do to incorporate a critical stance using the information in the vignette? What are additional questions you have and might research about the community?

Looking back at Figure 5.2 we could ask the following question to help us better utilize the information gathered from the previous Community Walk: "How can this task model care, love, and respect for our community and culture?" Vignette 12 is a Community Walk activity that delves a little deeper into a community issue by incorporating critical components for students to consider.

VIGNETTE 12: COMMUNITY WALK TO THE SUPERMARKET (ALL NAMES ARE PSEUDONYMS)

I visited various locations in the community surrounding Beardsley Magnet School. One of the locations that I took a picture of was called Amigos Supermarket. From researching online, I learned that the market is based on Hispanic culture and also sells takeout

food that is cooked Puerto Rican style. This market is quite small, but it is an important part of the community because there is a large Hispanic population within the surrounding community of the school. This market provides evidence of mathematics because to obtain the goods within the market, one must have the appropriate amount of money to be able to make a purchase.

As I mentioned before, the supermarket is quite small and the parking lot can barely fit three cars. The aisles are very narrow such that one person being in the aisle can make it so there is no room for another to pass by. In comparison to large chains of supermarkets, such as Stop & Shop®, an investigation can be conducted as to how the amount of money that a business has affects the size of the building, parking lot, advertising, the prices they put on the same items, and so on. To carry out this investigation, students would need to determine the area of Amigos and Stop & Shop buildings and parking lots. Students would also determine items that are sold in both stores, but are of different prices. From comparing prices of the same items, students would make comparisons as to which store has higher prices.

From the data that the students collected, they can determine which store they think most people in the community would want to go to and why. They could also discuss other factors that might affect the store that customers choose to shop. One of the other factors that students could investigate is that both stores sell prepared food for people to eat. For example, Amigos sells rice and beans and various meats for takeout while Stop & Shop has a café where people can buy coffee and various foods to consume within the store. The students could compare the prices on the menus and the amount of options on the menu for customers to choose from, which may lead to a customer being more inclined to go to one store over the other.

Although both Community Walk scenarios involve money, Vignette 12 introduces a critical component by having students compare prices and menu options as well as discussing why community members might choose one store over the other. Students might recognize that their families patronize the smaller local store because it carries more traditional foods their family likes, or they know the owners, or even because of proximity to their homes. In that case, the idea is that bigger isn't always better. In Vignette 12, we answer the question from Figure 5.2, "How does this task focus on how our culture/community is valued and respected?" In small communities, local businesses are valued because they tend to engage with the community on a local and more personal level than the larger chain stores.

USING CHILDREN'S LITERATURE TO BUILD CRMTASKS

Children's literature is a great way to introduce children to mathematics all around them. Children love reading books and having books read to them, and many schools have a literacy focus in the elementary grades. Many teachers are aware of children's literature books that have a mathematics focus and how to utilize mathematics stories in read alouds. We have experience with cult favorites like *The Very Hungry Caterpillar* by Carle (1969), *The Button Box* by Reid and Chamberlain (1995), *The Greedy Triangle* by Burns and Silveria (1994), and many many more. But we also want you to see literature as a potential tool for engaging in cultural inquiry. There are many benefits to using children's literature to make connections to mathematics. This strategy can be used to create an interdisciplinary lesson, connect mathematical concepts to the real world, and as students love stories, they can sometimes see themselves reflected, they can be transported into different spaces and learn about others, and they can make-believe.

In this section, we want to focus on using children's literature that is culturally diverse and not necessarily already centered on mathematics. We'd like you to consider books that are focused on historical, cultural, and social events to target student identity and agency. We want to suggest selecting stories that connect to students' real lives. For example, you might choose *City Green* by DiSalvo-Ryan (1994), a book about a neighborhood that decides to make use of a vacant lot in the middle of their block. The book features a girl named Marcy who many children might relate to. The applicable mathematics content is area and perimeter. The social context is beautifying your community and growing your own vegetables. Even more, the book shows how Marcy and her neighbors were empowered to go to their city hall to ask for a permit to use the vacant lot. The community worked together to clean the lot and plant the vegetables, and they also showed kindness to their elderly neighbors by providing them with vegetables from the garden. This book is a great way to explore mathematics but can also be used as a springboard to discuss relevant social justice issues in your students' communities. In Figure 5.3 we offer several other ideas of how to use children's literature to introduce or explore mathematics concepts. In choosing the literature, you should consider books that have diverse characters, diverse stories—especially those that inspire—and authors of color and female authors.

FIGURE 5.3 ● Children's literature and mathematics

CHILDREN'S LITERATURE AND MATHEMATICS CONTENT	STORY AND CULTURAL RELEVANCE
One Hen by Milway and Fernandez (2008) *Mathematics content:* Currency conversions, money amounts, and growth patterns (number of hens)	This book is about a young boy named Kojo who lives in a small village in Ghana with his mother. The people in Kojo's village would save up money together and each family would have a chance to use the money when it was their turn. It was Kojo's mother's turn and after using the money for what she needed, she has a few coins left over. Kojo decides to buy a hen with the money so that he and his mother can eat and sell the hen's eggs. After selling eggs for six months, Kojo has enough money to buy two more hens and after a year he has 25 hens! Eventually, Kojo saves enough money to go back to school. He uses his education to pursue his dreams of having his own farm. *Cultural relevance:* Focus on collective agency. The village people worked together to help each family succeed.
The Have a Good Day Cafe by Park et al. (2005) *Mathematics content:* Fractions (recipes), money amounts, and decimals	Grandma comes from Korea to live with her family in America. Although she misses her homeland, she is glad to help out watching her grandson. She loves making soup and other yummy Korean foods. The family owns a food cart where they sell pizza and hot dogs. To get more customers, Grandma and her grandson make a plan to change the menu to include some of her yummy Korean dishes. It works! *Cultural relevance:* Blending of cultures, pride in your culture
I Am Enough by Byers and Bobo (2018) *Mathematics content:* Time, indirect measurement (tree, mountain), numbers on number line (rope), skip counting (double dutch), and many more	*I am Enough* is told from the perspective of a young girl who talks about her many identities. She makes positive declarations about the many things that make her unique and special. The book promotes self-acceptance and inclusion through beautiful pictures of diverse children. *Cultural relevance:* Identity, inclusion, agency, and joy
Maybe Something Beautiful: How Art Transformed a Neighborhood by Campoy et al. (2020) *Mathematics content:* Area (brick walls), perimeter, and volume (paint)	Mira's neighborhood was gray and depressing. She met an artist and together they began to paint murals on the gray bricks around her town. The neighbors joined them with paintbrushes, music, and paint. The color brought them joy. *Cultural relevance:* Community action and joy
I'm a Brilliant Little Black Boy! by Drummond et al. (2016) *Mathematics content:* Money, large numbers (stars in the sky), addition (points in basketball), and many more	This book tells the story of Joshua, a kind and brilliant little Black boy. Joshua's mother tells him he is brilliant like the stars in the sky. Throughout the book, Joshua tells us about what makes him brilliant. He is an artist, a poet, a basketball player, a superhero, and a business owner of a lemonade stand. Joshua can inspire other children to give their best to be who they want to be. *Cultural relevance:* Agency, identity, and kindness

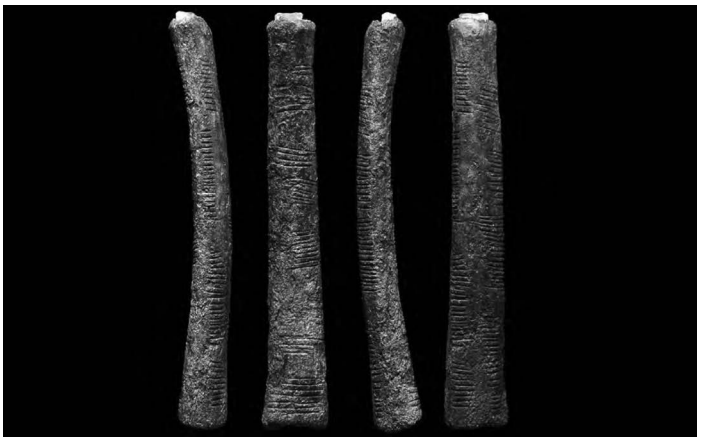
We reminded you about some favorites that we've used in the past to make connections between mathematics and children's books that we have in our classrooms and school libraries. Many of our old favorites, however, were not very diverse and oftentimes depicted people of color and more specifically Black people in deficit terms. The books we offered in Figure 5.3 provide some

broadening of the stories we have to choose from today. These stories highlight the strength and resilience of diverse people in the United States and beyond. In addition, the stories offer more diverse contexts to create cultural inquiry in mathematics tasks.

USING CULTURAL ARTIFACTS AS A SOURCE OF MATHEMATICAL KNOWLEDGE

A fourth approach to creating mathematics tasks from culture is in finding a particular cultural artifact or tradition and generating inquiry around whether this particular notion is currently useful, particularly in thinking about culture across local contexts. An example is given in Figure 5.4 based on the Ishango Bone, discovered in the present-day Democratic Republic of the Congo, believed to be around 25,000 years old and widely considered to be the second-oldest mathematics artifact in the world.

FIGURE 5.4 ● Mathematical Treasure: Ishango Bone*



Source: © Royal Belgian Institute of Natural Sciences. All rights reserved.

*See Resources, page 129.

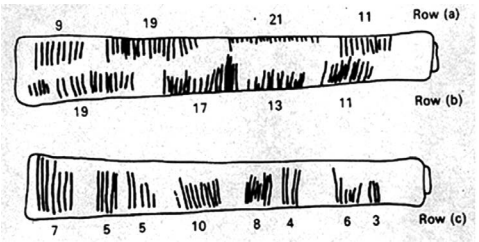
Students examine the Ishango Bone, the second-oldest mathematics artifact in the world, discovered in the Democratic Republic of the Congo. As they explore the bone through pictures and video in groups, they are asked to imagine the possibilities of what it could have been used for. Students are then asked to explore and discuss the many things African and African American people have created in mathematics and are challenged to discover more "hidden figures." Students can also brainstorm common community activities involving objects that might need measuring or counting, and "create" a community bone to measure/count something they love.

This example is one of cultural inquiry, but it goes further in focusing on the contribution of African culture to mathematics. Similar tasks could be created around the many examples available of Indigenous and ancestral mathematics (consider the Peruvian quipu and the Chinese abacus). This focus stands in contrast to traditional mathematics emphasis that does not take into account the contributions of non-European communities to mathematics. We see this as an empowerment notion and a way to affirm the value of Black, Indigenous, and other nonwhite cultures in mathematics creation. In the Ishango Bone example in Figure 5.4, the task tackles an important cognitive focus of most third-grade curriculum expectations—place value and number and operations. But perhaps more important, the task opens the door to conversation and probing around the exclusion of non-European knowledge in mathematics. By examining the history and relevance of the Ishango Bone, students can begin to unravel a hidden, inclusive, and more expansive history of mathematics.

IMAGINE

Brainstorm how you might use the figure of the Ishango Bone with your students. What do you notice/wonder about the mathematics, the people, and the use of this "counting" instrument?

FIGURE 5.5 ● Notches on Ishango Bone*



*See Resources: Mathematicians of the African Diaspora, page 129.

Taking a closer look at the Ishango Bone (Figure 5.5), archaeologists found groups of notches in three columns. A possible pattern for the first row of numbers is: 10 – 1, 20 – 1, 20 + 1 and 10 + 1. What is the significance of 10? What is another possible pattern for the first row? At first glance the number patterns on the Ishango Bone might seem pretty basic or even random. However, when we consider the era of the bone (ca. 17,500–20,000 BCE), we must ask ourselves, who are these people who created a number system using "base 10," prime numbers, and possibly doubling—all of this *before* paper and pencil were invented and *before* formal schooling? Who are the children in today's classrooms who need to learn about the complex thinking that was emerging in African nations in addition to Egypt? The answer is certainly African American children, but in essence, all children benefit from learning about the contributions of all people to mathematics. This helps us answer the cultural inquiry question in Figure 5.2, "How can this task draw from and illuminate the beauty and wisdom of my students, our community, and culture in ways that have been hidden or ignored?"

Summary and Discussion Questions

In this chapter, we looked at cultural inquiry by attending to students' culture and community as a foundational basis for creating mathematics tasks. We moved away from the individual "I" to a space that embraces our collective community of "we." This process is multifaceted, and there are many factors to consider in this "We Care/We Belong" approach. To assist you in the process, we shared stories of several teachers' experiences with interviewing students and walking the community to learn about their students, both of which are effective strategies to help teachers form authentic relationships with students. In addition, investigating cultural artifacts and ancestral mathematical knowledge helped these teachers to expand the history of mathematics. With some inquiry of their own, teachers can deepen their understanding of their students' lived experiences and funds of knowledge as a resource for their teaching, shifting their focus from the mathematical complexity component of cultural inquiry to the cultural complexity of the mathematics tasks they create. Before moving to the next chapter, where we will provide a process for using the cultural inquiry model to design mathematics tasks that attend to cultural complexity, consider the following questions:

1. Conducting a student interview is a good way to begin to understand students' lived experiences. When developing your questions, how can you go beyond superficial ideas about their culture and community? What kinds of questions can you ask, or what topics can you choose, to accomplish this? Why? What powerful aspects of community/culture could you highlight with tasks taken from that topic ("We Notice")?
2. We suggested taking a Community Walk to determine funds of knowledge in your school's community. How can you use this acquired knowledge to deepen what you understand about your students and the community/culture around them ("We Think")?
3. What is valued and respected in your students' culture/community ("We Think")? How can you model care, love, and respect to mine what has been ignored and illuminate what has been hidden in your students and/or their culture and community ("We Respond")?

CHAPTER 6

Creating Contexts for Agency and Action

In this chapter we will:

- Explore social justice standards to guide context for critical exploration
- Support individual and personal development issues for creating contexts for empowerment
- Examine community aspirations as a source of social justice pursuits
- Explore targeting agency through children's literature
- Advocate racial justice issues as a source for creating prompts

We will now tackle our most hopeful—and urgent—advice for task building: creating contexts and prompts that empower children and their teachers to engage in the work of collective action for justice. In this chapter, we ask you to consider how agency is targeted in the development and adaptation of mathematics tasks. We'll use words like *empathy, social justice,* and *collective action* in the process, while also understanding that your experiences as a teacher of mathematics may not have involved these words. We offer four additional approaches for mathematical task building to nurture agency and action: (1) selecting the "right" topics for critical contexts and action through social justice standards, (2) creating contexts for individual and personal empowerment, (3) creating contexts to support community aspirations, and (4) creating prompts from emerging social and racial justice issues.

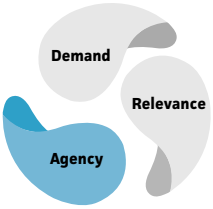
I have tried a social justice unit in my own classroom, but I did not fully commit. I was nervous with my students' reactions to the unit of study. I know that social justice units should make students feel empowered to make a change by learning essential information. However, I am nervous that once they learn about the topic, they will feel as though they can't make a change and are stuck where they are.—Michelle (2018)

ASK

What is mathematics? For whom is it? For what purposes? Examine your beliefs about learners, learning, and mathematics content. Do your beliefs help or hinder your students' development of a positive mathematics identity?

One of the most powerful elements of CRT lies in how it empowers teachers to work in, with, and for the communities they teach. When children possess a critical consciousness about the world around them, they are empowered to use knowledge to engage with empathy to create solutions for a just society. Teaching for justice requires a full commitment and should not be taken lightly.

WHEN WE SAY AGENCY



As we stated in Chapter 3, *agency* refers to how teachers and young children are able to see and use mathematics as a means of pursuing justice, equality, and progress in their communities and in the world. We believe it is not only possible but also necessary that teachers design appropriate contexts and prompts promoting action and empathy as early as the young elementary level. Operationally, agency is a loaded term, so let's take some time to be transparent about how we are using it for practice.

First, we reject deficit thinking, language, and approaches in our work to support agency, and we see ourselves as advocates, allies, and members of the groups of children we teach. CRT emphasizes solidarity. We want you to see "them" in strengths-based and empowering ways as you create/adapt mathematics tasks. Doing this means paying particularly close attention to language, stereotypes, and "fix them" approaches to context building, which we'll explore further in the coming sections.

Second, we prioritize *both* community/collective action as well as individual empowerment. We see the teacher working in solidarity with communities, not merely as a facilitator of one-on-one experiences; each and every child is a proxy for the collective, representing both themselves and their community at the same time. Ignoring collective belonging and action ignores the essence of CRT (as opposed to personal or individually relevant teaching notions) and social justice aims.

Think of agency as people being able to live a life where justice, equality, and thriving are prioritized. In the collective sense, we

ASK

What are examples of deficit language and thinking about people and groups? In what ways can we use language and context for solidarity with the communities we teach?

always mean fighting/standing/speaking for justice (remember the CRMPractices in Chapter 1) as fighting for "people." In our communities, we see this as exploring how racial and social equity can be better understood and addressed with and through mathematics. We'll explain how this works later in the chapter.

We believe it is not only possible but also necessary that teachers design appropriate contexts and prompts promoting action and empathy as early as the young elementary level.

USING SOCIAL JUSTICE STANDARDS TO GUIDE TASK CREATION

The main places where teachers get stuck when designing CRMTasks are understanding where the issues come from and discerning what might be appropriate for young children to learn. We see so many teachers struggle in isolation with ethical questions and their discomfort in having these difficult—and necessary—conversations. Our advice is to get support from existing curricula and standards guides and the various organizations that have developed guidance for having social justice conversations. As we stated earlier, young children deserve to learn mathematics in ways that shape their lives and the lives of those around them. We prioritize this for mathematics teaching because of the imbalance in racing toward the end goals of abstract mathematics tasks (naked math, as we call it, or so-called neutral mathematics contexts) for young learners.

There are growing resources and curricula that can be used to frame the areas and scope for creating contexts and prompts that target agency and action. One critical source of inspiration and guidance for our work is *Learning for Justice (learningforjustice.org) Standards for Social Justice*. This site is operated by the Southern Poverty Law Center, with its mission "to be a catalyst for racial justice in the South and beyond, working in partnership with communities to dismantle white supremacy, strengthen intersectional movements and advance the human rights of all people." The *Learning for Justice* website features 20 anchor standards covering four domains: identity, diversity, justice, and action. Each of the four domains are designed to assist school districts with a systemic approach to antibias, social justice, and civil rights education. In addition, the site provides excellent guidance on several topic areas, such as Race and Ethnicity, Religion, Ability, Class, Immigration, Gender and Sexual Identity, Bullying and Bias, and Rights and Activism.

While we strongly suggest taking the time to read through and reflect on the full list of standards, we have selected a few in particular that we feel are especially useful as the foundation for task creation for the elementary grades:

> *Students will recognize traits of the dominant culture, their home culture, and other cultures and understand how they negotiate their own identity in multiple spaces.* (Identity Anchor Standard 5)

> *Students will develop language and knowledge to accurately and respectfully describe how people (including themselves) are both similar to and different from each other and others in their identity groups.* (Diversity Anchor Standard 7)

> *Students will analyze the harmful impact of bias and injustice on the world, historically and today.* (Justice Anchor Standard 13)

> *Students will plan and carry out collective action against bias and injustice in the world and will evaluate what strategies are most effective.* (Action Anchor Standard 20)

To explore how a social justice standard might be used for task creation, consider Vignette 13:

VIGNETTE 13

Mrs. Knighten planned a mathematics activity she believed would increase her fifth-grade students' awareness of homelessness within their community. First, her students watched a video about an initiative in a nearby community to find permanent housing for 256 homeless families. They discussed the possible impact of the initiative and the importance of finding solutions for homelessness. After discussing the initiative, Mrs. Knighten challenged her students to use data graphs to represent the initiative's impact. Students were prompted to represent and interpret data in line plots and stem-and-leaf plots. Students were asked to address how the initiative was impactful and develop arguments about the causes of homelessness and consider the number of people who are homeless in their community. They collected data in a table and then created a line plot to represent data from each day of the campaign. They shared experiences they have encountered related to people experiencing homelessness and ways they have seen people help those experiencing homelessness.

By working cooperatively to solve problems related to homelessness, students in Mrs. Knighten's class have the opportunity to express and develop empathy for families so affected.

IMAGINE

Consider that, over 100 days, shelters in Vignette 13 traced their progress of placing families into homes. At the end of the sixth week, 54 households had already left the shelters and entered housing! What are other social justice issues Mrs. Knighten might have students discuss and do further research on? What are possible follow-up actions that can be taken?

This is depicted in Action Anchor Standard 16: *Students will express empathy when people are excluded or mistreated because of their identities and concern when they themselves experience bias.* We see agency in having the task prompts ask students to both illuminate data through representation and also develop arguments about homelessness using the data. In addition, the students demonstrate an appreciation for their community, and they will be further empowered to make informed decisions about themselves and the community in which they live.

PROMOTING INDIVIDUAL AND PERSONAL EMPOWERMENT

A direct way to frame agency in tasks is to plan problem contexts and prompts to focus on empowering students personally. When students use mathematics to solve problems in their own lives and the lives of people they care about, they develop agency and take action. Helping young children understand their bodies, hygiene, positive relationships, and behavior is likely already emphasized in many places in the current curriculum. Sometimes teachers see this as an opportunity for students to select the things that interest them, and while this approach has value, we believe it's possible to go even deeper.

When students use mathematics to solve problems in their own lives and the lives of people they care about, they develop agency and take action.

Let's consider how the issue of bullying might be tackled in a mathematics task. In the example below, we take a third-grade task where students represent and interpret data (see CCSS 3.MD.B.3) to focus on empowering students on the issue of bullying:

ASK

Consider the students in your own classroom. How do you think they will approach this task? How will you set it up for them to experience personal empowerment?

What bullying is happening in our school? According to the National Center for Educational Statistics, one out of every five (20.2%) students report being bullied. How realistic does this seem in your school? Create a survey of five questions about bullying. With permission, give the survey to 10 students and create a graph to represent the data collected. What did you find out? How do your results compare with the national data?

STANDING IN SOLIDARITY WITH COMMUNITY ASPIRATIONS

More than *learning about* community, we want you to *stand for* community. For example, imagine that a community of which you are a member is concerned about a historic Black building that is at risk of being lost to gentrification. Let's also assume that this building is an important landmark and resource for the community of the students you teach. Creating a task that involves children as members of the community "response" is a powerful action for supporting agency. Take a look at how we start with an original task from an elementary text and use it to create a task focused around neighborhood cleanup.

More than learning about *community, we want you to* stand for *community.*

Original Task (from Investigations): An office building has 14 rooms, all the same size. Steve uses $\frac{3}{4}$ of a gallon of paint to paint one office ceiling. How much paint will Steve need to paint all of the office ceilings?

Improved Task: Every year the neighborhood cleanup crew goes through the Hollow neighborhood to assist their elderly neighbors with basic home renovations and cleanup. This year we will assist seven neighbors to paint the fences outside their homes. We will need about $\frac{3}{4}$ of a gallon of paint for each fence.

a. How much paint will we need to paint all the fences?

b. How might this project be adjusted to make a difference in your neighborhood?

Source: kali9/iStock.com

IMPROVE

Think about a current community issue or project that interests you and/or your students. How can you stand in solidarity with the community? Search your mathematics curriculum for a task that can be adapted to address this issue.

As you can see, the contexts are not that different. Neighborhood cleanups represent issues that come with community buy-in, because they often originate in common aims where people have already come together to formalize a plan. Reframing a task like we did on the previous page centers the agency of standing in solidarity with the community cause. Our re-created task illuminates how local action can work to impact the value of people we care about. Additionally, there is a clear underlying message of supporting senior residents and their value to the community. The tradition of respecting and taking care of the elders in our communities is highlighted and students can be encouraged to provide more details for the class based on their personal connections.

TARGETING AGENCY THROUGH CHILDREN'S LITERATURE

Similar to our view of using children's literature for purposes of creating tasks from cultural contexts found in books, we also see children's literature as an excellent tool for fostering agency. Critical literacy is an important aim in English language arts standards. Consider the following excerpt from the NCTE's (2020) website, NCTE.org:

> *Critical literacy should be viewed as a lens, frame, or perspective for teaching throughout the day, across the curriculum, and perhaps beyond, rather than as a topic to be covered or unit to be studied. What this means is that critical literacy involves having an ingrained critical perspective or way of being that provides us with an ongoing critical orientation to texts and practices. Inviting students to write down the messages that they see in public transport, to take photographs of graffiti or billboards, to cut out advertisements from magazines, or to collect sweet wrappers to bring to class helps them to read the everyday texts they encounter critically. Do it often enough and they will learn to "read" their worlds with a critical eye.*

IMAGINE

Think about a children's book that has an important message or experience around agency. Now use that very principle of agency in a mathematics task.

Notice that the standards extend this notion of critical reading beyond books (although books are great places to begin) to an examination of the many messages children see in public.

For example, take the book *I'm a Brilliant Little Black Boy!* by Drummond et al. (2016) mentioned in Chapter 5. In the very beginning of the book, Joshua's mother tells him he is as brilliant as the stars in the sky. She affirms to him a positive identity that he carries with him throughout the book. Her affirmation of who he is provides

him with the self-confidence to be the best at anything he sets his mind to. During his time at school, his brilliance is again affirmed by his teacher. He wants to answer the question but understands that even if he is not called on he is happy with himself for knowing the answer. The teacher does in fact call on him, and he is happy to oblige. After school in the barbershop, he is affirmed by the handsome haircut he gets and on the basketball court where he feels free and confident. In his neighborhood, he is affirmed by his neighbors because they stop to purchase his lemonade. He saved his allowance money and used it to open a lemonade stand. He is a young entrepreneur in the making. If Joshua's teacher is aware that he likes basketball, has a lemonade stand, and visits the barbershop, they can use those contexts to make connections to Joshua's lived experiences. Even beyond mere connections, they should use those contexts to affirm Joshua's brilliance just like the character in the book. In Chapter 3, we provide an example of a mathematics problem that brings in the context of the barbershop; however, instead of focusing on the prospect of being a consumer (or customer), we focused on the prospect of being the business owner. This is a great way to center the problem around agency. Provide students with the idea of what they can dream and become, not merely answer questions to a contextual mathematics problem (even when that context is familiar).

Another way to build students' agency through books is to have them read nonfiction children's literature. They can learn about the lives and accomplishments of historical figures from their culture. By learning about the struggles that people experience and then how they persevered and realized their dreams, students can begin to recognize their own resilience. As we said earlier in this section, this is ongoing work and every attempt at building students' agency is a step in the right direction.

CREATING PROMPTS FROM CURRENT JUSTICE ISSUES

We march for Breonna Taylor!
Say her name!

These were familiar refrains at *Black Lives Matter* (BLM) protests worldwide during the summer of 2020. For those who participated, the words represent an important stance for CRT—standing in solidarity with others to effect social justice. Standing in solidarity with current racial and social issues affecting students and their communities is also an important stance from which to design mathematics tasks. In the following example, we describe mathematics tasks that are positioned from this vantage point.

Source: RichLegg/iStock.com

Libby started a project to make homemade masks to donate to families in her community at the beginning of the COVID-19 pandemic in 2020. Her community has been hard hit by a shortage of masks and a lack of community outreach, with many people lacking reliable internet and other ways of staying informed. She found cotton fabric online that measured 6 feet long and 45 inches wide. The mask design she used requires two 9 inches × 6 inches pieces of tightly woven cotton along with elastic strips.

a. How many masks is Libby capable of making with her design?

b. How much fabric is needed to support 85 families with adult masks?

c. Children's masks require two 7.5 inches × 5.5 inches pieces of fabric. How would this change Libby's efforts to make both adults' and children's masks?

d. What else do you think Libby can do to help her community?

This task shows solidarity, as it focuses on supporting the needs of families during the COVID-19 pandemic. The empowered focus of the context is to help fight the spread of the coronavirus and care for the health of our communities. The issue of justice is important because of the way in which the pandemic revealed injustices in access to care and resources in poor communities and those that are predominantly people of color. This task context could lead to further exploration about these disparities, community ingenuity, sacrifice, and resilience. The task prompt places learners at the center of creating action (see d) beyond merely solving a situation that has been mathematized. We see

ASK

Reflect on the social issues that affect the community of the students you serve. What are some lesson topics that could support solidarity and belonging?

this as critical to tasks around agency and action—they should drive more powerful, human conversations around mathematics than just right answers.

Think back to Figure 5.1: *Approaching cultural inquiry from a "we" perspective*. When you consider the approach of "We Notice," tasks can be constructed via prompts to explore how children sense and see issues they care about and how those issues show up in their lives and in their community. Likewise, it is essential that the community of teachers, students, and others reflect on where they stand with regard to issues of social/racial injustice. During these initial stages of inquiry, they can discuss and collaborate on individual and collective viewpoints on issues affecting the community. "We Notice" means teachers and students explore issues in depth both holistically and through mathematics structures and concepts. Both students and educators are challenged to wonder and think about these issues, to develop their own positions and ideas, and to respond with action.

Consider the following grade 1 task as it pertains to community social justice issues:

> CCSS.MATH.CONTENT.1.OA.B.4.
>
> *Understand subtraction as an unknown-addend problem. For example, subtract 10 – 8 by finding the number that makes 10 when added to 8.*
>
> *Our school district will install internet towers all over the district so that more families can have access to the internet. In the first month, the district added internet towers to seven more neighborhoods in the district. Now 11 neighborhoods have wifi. How many neighborhoods had internet access to start with? How can we help our friends who need the internet?*

The aftereffects of the coronavirus pandemic will be something that educators will need to face for years to come. Young children understand the ramifications of living in a pandemic on a personal level and know the impact that the internet plays in their lives, but this question asks students to think beyond themselves to imagine what it might be like to live in a neighborhood where the internet is not available. Children at a young age are able to see that unfairness and disparity exist all around them. Learning to respond with empathy, and with mathematics, helps them grow as both compassionate community members and mathematicians.

ASK

How do you know when to push exploration into difficult topics? What is key to handling such interactions with care and empathy?

Notice in the last prompt that we asked children to consider how to help (take action). There are a great many opportunities to learn from the short context given here. For example, this task may lead to some discussion around the "why" of internet access, and "whom" it is for. Although we acknowledge that there is great care needed for such conversations, the teacher's role here is to adapt and create tasks for this possibility. This task is one to which most students can relate because they have experienced the need for reliable internet. In addition to "noticing" the community justice issue of accessible internet and education resources, the mathematics task involves students' understanding of the relationship between addition and subtraction as described in the Common Core Standard.

Now consider the following grade 5 task:

CCSS.MATH.CONTENT.5.NBT.B.7.

Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Rooftops are covered by shingles, which take approximately 300 years to decompose in a landfill. When a contractor replaces a roof, the shingles should be disposed of in a safe way. A recycling company purchased land in an urban city for contractors to dump their shingles so the company could grind them to be repurposed for building roads. Unfortunately, the shingles were only dumped, forming a mound that grew so large it became known in the community as "Shingle Mountain." In addition to this being an eyesore, it was next to a neighborhood and caused health issues with the residents. Several years after a resident filed a complaint with the City, the recycling company was ordered to remove the mountain (Fears, 2020).

a. On the most productive day of the removal, there were 304 trips (truckloads), with a total of 5,491.81 tons removed that day. About how many tons were removed per trip?

b. Shingle Mountain had a total of 154,396.2 tons. If they kept up at that rate (5,491.81 tons removed per day), how many days would it have taken to remove the entire mountain?

c. On a less productive day, they removed 228.36 tons in 9 trips (truckloads). About how many tons did they remove per trip? How many days would it take to remove the total mountain at this rate?

d. The project took a total of 9,098 trips over 70 nonconsecutive days. About how many trips (truckloads) were removed per day?

e. Is there an environmental issue in your community similar to "Shingle Mountain"? What are some ways you might take action to help?

(Adapted from *Data Source*: www.keranews.org)

This task is an example of recycling gone bad and who it affects. The shingles were dumped in a part of town that was zoned for industrial manufacturing even though it was very close to a residential area, so this task can lead to discussions about zoning, districting, and the importance of residents speaking out about the advantages and disadvantages of zoning and who is adversely affected in many circumstances.

Summary and Discussion Questions

In this chapter, we offered four approaches for mathematical task building to nurture agency and action: (1) selecting the "right" topics for critical contexts and action through social justice standards; (2) creating contexts for individual and personal empowerment; (3) creating contexts to support community aspirations; and (4) creating prompts from emerging social and racial justice issues. In this chapter, we shared some strategies for selecting topics for tasks, using the example of the Southern Poverty Law Center's Learning for Justice website as a great place to start with their social justice standards. The topics can be applied to the contexts of individual and personal empowerment, supporting community aspirations, and in solidarity with emerging social and racial justice issues. Before moving on to the next chapter, where we explore notions of CRT and look at how teachers improve and implement culturally relevant tasks, consider the following questions:

1. Our first approach to task building is selecting the "right" topics for critical contexts and action through social justice standards. Using your district curriculum as a starting place and the social justice standards as a guide, focus on one existing task to begin to modify the context into one that is culturally relevant.
2. When you select or create a task with the goal of individual empowerment for your students, what are some components or aspects that are essential to the task and the experience for your students?
3. Selecting a task and the appropriate context comprises only part of task implementation. So much of what happens in the task is dependent on teaching. Consider Vignette 13 on homelessness. What teaching decisions are critical for the success of the activity?

4. Some students watch the news with their parents and engage in age-appropriate conversations about current events such as the pandemic and racial justice. In what ways do you make emerging social and racial justice issues age-appropriate for your mathematics tasks with younger students?

PART III

Refining Our Notions and Experiences

In Part III, we will share about our work with established and early career teachers and teacher leaders on their journey to understand CRMT and interpret and implement CRMTasks, lessons, and units. We will also share a common teaching approach called teaching through problem solving, along with other selected tools that have been created and refined by teachers.

CHAPTER 7

The Journey: Improving Culturally Relevant Mathematics Teaching

In this chapter we will:

- Explore teachers'—and your own—notions of culturally relevant teaching
- Examine how teachers work to implement tasks for culturally relevant mathematics teaching
- Explore teachers' experiences fostering critical agency
- Explore teaching mathematics for social justice

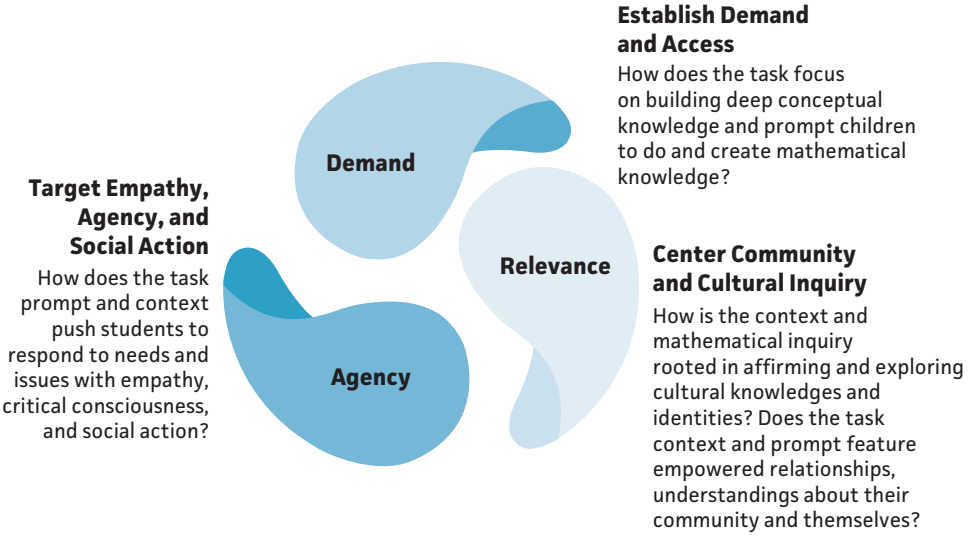
In the last three chapters, we introduced and explored 13 approaches for creating and adapting CRMTasks, and you have taken an important step in learning some design approaches. Such tasks make CRT possible and can be an anchor of an inspiring lesson. But as we mentioned in Chapter 2, teaching involves more than simply choosing the tasks for children to do. Designing CRMTasks is not a magic pill. In this chapter, we will turn our attention to thinking about teaching. Remember the foundation we laid in Chapter 1: CRMT involves challenging students as doers and creators of mathematics, prioritizing culture and community as drivers of mathematics inquiry, and targeting agency, empathy, and action as outcomes.

TEACHERS' AND LEADERS' NOTIONS OF CULTURALLY RELEVANT TEACHING

It's important to acknowledge that sustaining CRT in mathematics is a career-long journey where teachers and leaders challenge, reject, disrupt, and grow their own notions of how mathematics can be experienced, what the experience should look like, and for what purposes. Our experiences have taught us that what teachers believe and understand about CRMTasks directly determine how successful they are in creating and teaching CRMTasks. In this chapter, we share and examine how teachers and teacher leaders interpret notions of CRMT and apply them for practice. We'll also analyze their work in the context of CRMTask building as well as teaching, which we hope will encourage you to reflect on these issues in your own teaching (Figure 7.1).

Sustaining CRT in mathematics is a career-long journey where teachers and leaders challenge, reject, disrupt, and grow their own notions of how mathematics can be experienced, what the experience should look like, and for what purposes.

FIGURE 7.1 ● Culturally relevant mathematics task-building actions



CULTURALLY RELEVANT TEACHING AS MAKING MEANINGFUL CONNECTIONS

Understanding the mindset of new teachers is a good place to start in our discussion of the journey. In an undergraduate *Math*

and Diverse Cultures course, Shelly (Jones) asked new teachers to write their personal definitions of CRT. Teachers were asked to respond without looking up any information so their thoughts could be authentic. There were several themes that emerged from their definitions, which align with much of what we have discussed previously in this book. One consistent acknowledgment was that they need to "make meaningful connections to students in order to help students to feel important and engaged, which will in turn help them do better on their assignments." Many wrote about how they need to "tailor the work based on students' day-to-day lives, their learning styles, and their interests."

Even though they are new to the field, these teachers already understand that making connections to students' real lives and their cultures is an effective instructional strategy, and that academic success is part of the goal. These new teachers were also aware that CRT requires the teacher to learn about different cultures within their classroom. What is missing from their current knowledge is the need to center their instruction in cultural and community inquiry (Relevance). This means going beyond merely inserting tidbits of information about students' interests, culture, and community. The idea is for the new teachers to learn how to create opportunities that empower students by engaging them in mathematics inquiry that affirms their culture and community. The component of *agency* was missing from these teachers' understanding as well. They have not yet understood the potential for their work to require students to critically examine issues leading to social action.

CULTURALLY RELEVANT TEACHING AS WORKING WITH CULTURE ONLY

Even when teachers focus on culture, it isn't enough to sustain CRT. As educators participate in professional learning opportunities directed at learning about CRT, they grow in their knowledge about what it entails. In one such professional development setting, we asked a group of K–5 teachers to write three words or short phrases to describe CRT. Again, we were not surprised. Many of the teachers responded with the words *relevant*, *culture*, and *equity*. Other common responses focused on knowing who your students are in their day-to-day lives, their socioeconomic status, their language, and about students' communities. These experienced teachers had more knowledge about individual students and the local community because (1) they were current classroom teachers and thus had experiences to pull from and (2) their school district was

participating in a district-wide "Diversity and Inclusiveness" initiative. These teachers also acknowledged that in order to teach from a culturally relevant perspective, they needed to be flexible in their planning as well as sensitive to and respectful of students' differences. One teacher made the point that students' life experiences are different and that doesn't mean the experiences are limited. Although the teachers agreed with many of the statements of their colleagues, they also acknowledged that big changes in the way they plan and teach mathematics would be required.

CRMT requires an empowerment orientation where students' identity and home culture are further affirmed through mathematical activity. When teachers start learning about students' cultures, it can be uncomfortable at times because teachers don't want to perpetuate stereotypes. That is why some teachers still choose to teach from a "colorblind" orientation. They think that by not "seeing" race or culture, they can treat everyone the same. Unfortunately, this thinking does quite the opposite. It renders students of color as invisible and causes them to have to leave their culture at home, which is impossible to do.

Remember the example of the ice-breaker activity Shelly did with a group of teachers enrolled in a summer program. The activity was to write three hashtags that would describe them as a person. The idea was for students to get to know each other and for Shelly to learn something about each student to use in future mathematics activities. One student wrote #Muslim. Another student was so excited when she heard #Muslim she blurted out, "I'm Muslim too!" Having learned that information, Shelly planned to talk about Islamic tessellations in a later activity. However, she also knew that if she left it at that she would not be learning *from* the students.

To establish cultural competence, the teacher should learn *from* the students, not just *about* them. Using the example of Islamic tessellations, a teacher might ask their Islamic students to share what they know about Islamic art and geometric design. Or they could learn about why women wear hijabs, which could then lead to learning about the growing number of hijabi women in the fashion industry and a lesson about mathematics in fashion design.

ASK

How does the example just given represent an empowerment orientation toward student identity and culture?

CRMT requires an empowerment orientation where students' identity and home culture are further affirmed through mathematical activity.

CULTURALLY RELEVANT TEACHING AS INCLUSIVE AND ANTIRACIST

During a professional learning session with mathematics education leaders, Shelly posed the same question as she did for the teachers—to brainstorm three words or short phrases to describe CRP/CRT. This leadership team had recently participated in a book study on how to become antiracist educators. The most popular words leaders offered to describe CRP were *equitable, inclusive,* and *antiracist*. Other words mentioned by multiple leaders were *relationships, empower, student-centered, identity,* and *unbiased*.

Of the three groups—new teachers, experienced teachers, and teacher leaders—the leaders' descriptions of CRP were most aligned with our notion of agency. These leaders seemed to have an understanding that culturally relevant experiences require that students use critical mathematical thinking to challenge the inequities that exist in our society so that they will be able to make empowered decisions about themselves and their communities. Of the three groups, the leaders were also the only group who participated in a learning opportunity that introduced them to the notion of antiracism in education. Their discussions during the professional learning sessions focused on how to orchestrate opportunities for teachers to rehumanize mathematics instruction through equitable, inclusive, and antiracist instruction and curriculum. The point here is that to get to the critical component of CRP, you must be intentional in your professional learning.

CREATE

How can we use the themes in Figure 7.2 to implement a mathematics lesson? Choose one word from each column. Describe how that word helps you to imagine/plan a mathematics lesson.

The descriptors from all three groups of educators are listed in Figure 7.2 and loosely fit into one of three themes: relevance, equity, and inclusiveness. It's worth noting that as the teachers—new and experienced—and the leaders read relevant literature and had more discussions about CRP, their understanding of CRP increased, showing that the more intentional one is in their work on becoming a culturally relevant teacher, the deeper their insight and knowledge base grows.

ASK

How do the themes identified by educators compare with the dimensions of the CRCD mathematics task rubric (Figure 3.2)? Where would tasks based on these themes fall on the spectrum of Emerging, Developing, and Exemplary?

FIGURE 7.2 ● Themes in educators' definitions of culturally relevant pedagogy

MAKING MATHEMATICS RELEVANT	CREATING EQUITABLE MATHEMATICS	CREATING INCLUSIVE SPACES
Community	Accessible, for all	Accepting
Connections	Differentiated	Awareness
Engaging	Economics	Diverse
Global	Informal	Embrace
Important	Multifaceted	Empathy
Interests	Multiple entry points	Encouraging
Linguistic	Open	Flexible
Local	Rigorous	Identity
Relatable	Student-centered	Mindset
Relevant	Vocabulary	Moral
		Relationships
		Respect
		Sensitive
		Unbiased

CONFRONTING "DIFFERENCE" IN CULTURALLY RELEVANT TEACHING

One of the challenges we see with teachers' definitions of culturally relevant teaching is the focus on the word *different*—different cultures, different languages, different traditions, different backgrounds, and differences between students. The portrayal of differences in this way can be seen as "othering." Othering describes the ways in which people and groups are portrayed as different, and the differences are translated as inferior to the dominant culture (Krumer-Nevo & Sidi, 2012). For example, when we refer to students as *English language learners*, we are pointing out what the students don't know—they are learning the English language—as opposed to positioning them from an asset-based perspective—multilingual learners—because they *do* have language *and* they are learning multiple languages.

ASK

How is language framed and utilized in mathematics experiences for young children in your current school environment? In what ways are other "differences" acknowledged or framed?

Why is it so important to value and affirm differences like cultural language when practicing culturally relevant teaching? When we learn about our students in their own voices, we can begin to see the value in their stories. You will be able to move beyond stereotypes, especially those that are derogatory. One teacher wrote about the idea of difference in this way, saying that culturally relevant teaching is about "respecting the

diversity of the students and using their unique differences to create an educational environment that is welcoming and respectful." We love this, and we would take it even further by encouraging teachers to think beyond the educational environment. Another teacher wrote about finding out what students have in common and using that in a lesson. Someone else talked about connecting lessons to the past so that students can learn about the diverse cultures that contributed to the development of mathematics.

When we learn about our students in their own voices, we can begin to see the value in their stories.

Another important idea arising from our conversations with teachers was for students to learn about cultures from around the world in order to have a "window" view. We believe students must have opportunities to see themselves in the curriculum (mirror view) as well as opportunities to be exposed to the broader world (window view). A mirror view would involve the teacher using students' interests, community funds of knowledge, and so on to have the mathematics reflect something the student has prior knowledge about and something that honors students, their families, and their communities. A window view could provide opportunities for students to learn about different family traditions: some families have a tradition of making and flying kites, while other families have a special game night, and others look forward to an annual camping trip. All of these activities are windows for students who are unfamiliar with them. For a more global view, a teacher could introduce students to different number systems and currency from countries other than the United States. This can be challenging for lesson implementation because often school districts choose mathematics curricula that come with set contexts. But even with a set curriculum, teachers can always find opportunities to make choices about the contexts in which they teach.

ASK

How will you build cultural competence for yourself? For your students? How will you build your capacity to think more critically about local and global situations that affect your students' daily lives and their futures?

LESSON PLANNING WITH AGENCY

What happens when teachers work toward agency while teaching? In her work with teachers, Shelly found that several themes emerged when teachers attempted to plan lessons using an agency lens: (1) the lesson could empower students to make changes in their lives, (2) the lesson could help students become more aware of issues that affect them, (3) in addition to creating social justice mathematics lessons there is a need to attend to

students' identities, and (4) as was mentioned before, the teachers struggled to teach mathematics lessons that have a critical component (Jones, 2018).

To assist teachers with the critical aspect of teaching mathematics for social justice, she suggested the following: a critically conscious teacher can become a part of the broader community through communications with parents, guardians, and community members. This might be done through inviting community members to participate in mathematics lessons as experts in certain context areas, by collaborating with parents as intellectual partners, or by attending after-school and community events. As teachers learn about how to become culturally relevant educators, they are able to gain more confidence by building relationships with students, parents/guardians, and community members.

Likewise, when students learn about each other it helps to build a classroom community. Although students learn from teachers, teachers can—and should—learn from their students. Students must feel safe in their classroom and that the teacher understands them and appreciates who they are. One teacher said it this way:

> *Culturally relevant teaching is recognizing the importance of including students' backgrounds or lived experiences in all aspects of teaching and learning within the classroom and across the school environment. [Teachers must] acknowledge where all [their] students come from and what they go through or experience on a day-to-day basis. Knowing where your students come from can be very encouraging for your students and could make them less scared to participate or less scared of feeling judged. It can empower them intellectually, emotionally, and politically.*

IMPROVE

What are some questions or thoughts your students have about a current event in your school, city/town, state, or our country? How can you mathematize this context to create a culturally relevant task or lesson?

CRP offers an alternative approach to teaching mathematics that capitalizes on students' rich cultural backgrounds. Therefore, a culturally competent teacher will take the time to move beyond simply using ethnically diverse names in word problems. They will develop relationships with their students such that cultural references become a natural part of planning mathematics lessons.

If we ask you to think about a mathematician, who comes to mind? If you are thinking of Einstein, Fermat, Euler, or Pythagoras, then you are like most other educators. If you are thinking of Katherine Johnson, Dorothy Vaughan, Mary Jackson, or Christine Darden, then you have author Margot Lee Shetterly to thank for the story and movie about these previously hidden

figures in mathematics. If you'd like a more diverse representation of mathematicians to share with your students, there are many great resources such as the websites Mathematically Gifted & Black (https://mathematicallygiftedandblack.com), Lathisms (http://lathisms.org/), and the updated website for Mathematicians of the African Diaspora (https://www.mathad.com/home). For teaching mathematics for social justice, see the Rethinking Schools website (https://rethinkingschools.org). You may also want to use children's literature books as a way to make mathematics and culture connections.

As we have mentioned previously, when a teacher chooses to revise a task to make it culturally relevant, the teacher must start with a task that is cognitively demanding. This is the foundation of a CRMTask at the Developing stage of the CRCD mathematics task rubric. The teacher would need to revise the task by connecting it to a student's or group's individual, cultural, or community knowledge. The underlying mathematics concept, objective, and/or standard of the revised task would remain identical or similar to the original task, though one of the challenges of revising tasks is in keeping the same high level of complexity. Selecting and implementing CRMTasks will be no different. Setting up the problem so that it remains cognitively demanding will be an important part of the process of revising tasks to be culturally relevant. Centering students in the task will help maintain the cognitive challenge because you are building on students' prior knowledge and making conceptual connections between old and new learning as well as between the mathematics and students' lived experiences.

USING CULTURALLY RELEVANT MATHEMATICS TASKS WITHIN UNITS

In one of our graduate courses, we asked teachers to create a culturally relevant mathematics curriculum unit. Teachers used the CRCD mathematics task rubric (Figure 3.2) to modify existing tasks/lessons/units from their curriculum and adapted them to be culturally relevant for their students. The teachers then used the rubric to evaluate the level of cultural relevance (Emerging, Developing, or Exemplary) for each lesson in the unit. The mathematics units included five to eight lessons, each at various levels of cultural relevance. Going through this process helped the teachers determine the quality of their lessons/units in terms of cultural relevance.

In one example, the teacher wanted to revise a current task and make it culturally relevant to her current fifth-grade students.

She started with a cognitively demanding task about a girl making tamales with her mother for the holidays. She read the book "*Too Many Tamales*" by Gary Soto to her students and then had them complete a mathematics task using a recipe. She felt that her students would be more connected to a story about Thanksgiving, so she changed the title of the problem to "Turkey Dinner." After reading the book and discussing the main points, she asked her students several questions: Have you ever cooked or helped cook a special meal with your family? What did you make? Do you remember what you had to consider when making the meal? How many people were you cooking for?

> You will be helping your family prepare a special recipe for Thanksgiving dinner. You need to figure out how much of each ingredient you will need, based on how many people will be eating. You need to look up prices of these items in a grocery flyer or an online website to determine how much the groceries to make the meal will cost.

By changing the name of the problem, the teacher feels that she is connecting to more students in her class; however, she acknowledges that "it is still not relevant to all students." She believes that she is, however, drawing from their community/cultural knowledge by connecting the problem to their home life. She says, "The original task was already a high cognitive demand task and then allowing students to use an actual recipe from home that they have for a holiday or special family meal, makes it more relevant and engaging/meaningful to them." This teacher's attempt at revising a problem to be culturally relevant is an example of an *Emerging* problem. Yes, the teacher tries to make a connection to her students, but her focus is still on making sure the mathematics of the problem (fractions, decimals, and measurement) stays intact. Even though she had students bring in recipes from home, there wasn't much of a focus on the importance of family traditions.

A second teacher chose a lesson from their textbook (Barta et al., 2014) on exploring the Navajo craft of beadwork. Students would learn about the Navajo people, the largest Native American nation of about 300,000 people in the United States. Students would create their own paper beadwork strips and then graph the number and color of beads used in their design. They would then interpret the graph to describe which colors were most and least frequently used. By incorporating this lesson into the curriculum, the teacher provides students an opportunity to learn about an important people in American culture and

they also cover a mathematics content standard (CCSS.MATH .CONTENT.1.MD.C.4) included in their district curriculum. It is important that students learn about how mathematics is part of everyday life, and in this case, they will learn about the mathematics involved in jewelry making. In addition to graphing and interpreting graphs using less than and greater than, the teacher intends to orchestrate a discussion about the patterns they see in the Navajo beadwork and will ask students to write about one thing they learned about the Navajo nation and/or Navajo beadwork. This is an example of a teacher using a lesson to build students' cultural competence using a "windows" view.

Summary and Discussion Questions

In this chapter, we discussed some ways in which teachers, teacher leaders, and leaders view culturally relevant teaching. We explored these views using the definition of *culturally relevant mathematics teaching* we have been drawing from in this book. As you use CRMTasks to create lessons and units for culturally relevant teaching, you may find yourself revising existing tasks from your curriculum. Consider the following as you think through the revision process and implementing tasks to incorporate into a lesson:

1. As you reflect back on what you learned early in your practice, how have your ideas about culturally relevant teaching shifted? How have you revised your idea of culturally relevant teaching? What thoughts and ideas you already had have been further confirmed?
2. Choose a mathematics task or lesson that you are already using in your classroom or have used in the past. In what ways did students respond? How did their responses point back to your application of culturally relevant teaching? What would you change?
3. In the examples in the chapter, we see the differences in understanding among teachers, teacher leaders, and leaders. Do you believe a movement of change is possible in your school or organization environment? What professional development work would be needed to build robust understanding of culturally relevant teaching?

CHAPTER 8

The Flow: Implementing and Refining Culturally Relevant Tasks, Lessons, and Units

In this chapter we will:

- Revise tasks to be more culturally relevant using a template
- Adapt and explore the three-part lesson for implementing culturally relevant mathematics teaching
- Examine the flow of a curriculum unit composed of teacher-created culturally relevant mathematics tasks

Now that you've gained an understanding of what CRMT is and what CRMTasks are, let's continue to explore how CRMTasks and teaching can be implemented in lessons and units that aim to promote engagement and challenge. For this we refer to a lesson approach called Teaching Through Problem Solving (Van de Walle, 2013), or the three-part lesson structure, also referred to in phases of "Before, During, and After," or "Launch, Explore, and Congress." Teaching through problem solving is a particularly robust approach that has great potential for illuminating the possibilities for CRT. For purposes of this chapter, we will use the terminology of *Launch, Explore*, and *Culminate/Congress* as we describe how to adapt the three-part lesson to teaching culturally relevant mathematics. We will

also navigate a process for refining mathematics tasks using a template, and we will examine the flow of a teacher-made curriculum unit.

WORKING WITH A MATHEMATICS TASK TEMPLATE

To assist teachers in the process of creating CRMTasks, we developed a template for revising a task to be culturally relevant. The template below is a tool for thinking through the process of task revision as well as training for future task creation work.

Using our rubric (Figure 3.2), teachers chose and evaluated a current task from their curriculum to increase the level of cultural relevance of the task from its current state. In Chapter 3, we provided suggestions under task-building actions on how to select a mathematics task that lends itself to revision for cultural relevance. The template (see Appendix A for blank Revising a Math Task to Be Culturally Relevant Template) then reminds teachers of several strategies for getting started in the revision process. The first question they should consider is, "What about the task I am trying to revise and how will I revise it?" After revising the task, teachers should ask themselves how the task empowers students. If they are unable to answer this question, then they must dig a little deeper to consider a different revision.

In the scenario in Figure 8.1, you can see how one in-service teacher used the Revising a Math Task to Be Culturally Relevant Template to assist them in selecting a task from their curriculum and revising it to be culturally relevant. The teacher was reminded to refer back to the CRCD mathematics task rubric (Figure 3.2) while using the template.

FIGURE 8.1 ● Completed Revising a Math Task to Be Culturally Relevant Template

Goal: Describe the desired movement on the CRCD mathematics task rubric (Emerging to Developing to Exemplary).

I would like to move the original task, "Two of Everything," from Emerging to Developing. I believe the original task would score as Emerging on the CRCD mathematics task rubric because it allowed for students to create their own rules for functions, but the functions did not connect to any "real-world" application. I revised this task to connect to the students' community and allow students to see how organizations in their community help the community. Students are able to give back to the community through a fund-raising event.

Original Task (should be a cognitively demanding task)

"Two of Everything" from *Lessons for Algebraic Thinking Grades 3–5*

The children's book *Two of Everything*, by Lily Toy Hong, tells the story of a magical brass pot that doubles whatever is put into it. The story is an engaging context for providing students with a beginning experience with examining a growth pattern, recording and extending data on a T-chart, and representing the pattern algebraically with an equation. The experience is then extended by changing the doubling rule of the pot to other rules for the children to figure out. The students use T-charts to represent what goes into and comes out of the pot and describe the patterns with both words and equations. Students also create rules of their own for others to guess.

Revised CRMTask

1. Students will take a look at different fund-raising ideas to raise money for a selected community organization in their city.
2. Students will research different community organizations to determine which organization our class would like to donate money to.
3. Students will determine the amount of money they would like to raise as a class.
4. Students will generate a list of fund-raising ideas: collect cans and bottles, bake sale, sell tickets to an event, and so on.
5. Students will generate T-charts and write equations to represent how much money could be earned from each fund-raising idea.
6. Students will use T-charts and equations to determine how long it will take to reach our goal with each fund-raising idea.

Why did you choose this task? What aspect of the task was the focus?

I focused on community funds of knowledge for this task. I liked the original task, "Two of Everything," but thought it could use a context that the students could use in the real world. The revised task allows students to examine growth patterns in different student-created fund-raising ideas, while the original task allowed students to create patterns but lacked a real-world context. Students must think about the expenses, profit, prices, and so on of various fund-raising ideas and reflect that in their T-charts and equations.

Using the CRCD mathematics task rubric, describe how the mathematics task was revised.

This task went from Emerging to Developing in the CRCD mathematics task rubric. It began as Emerging because the original task had a high level of cognitive demand, but it did not connect to the students' context. I was able to move the task from Emerging to Developing by connecting the idea of growth patterns to a fund-raising event the students would carry out for their community organizations. This would allow the students to use and explore growth patterns in a real-world context while allowing students to give back to their own community. While exploring growth patterns and writing equations, students had to account for possible expenses, profit, prices, and so on of their fund-raising ideas.

Math Content

Growth patterns and functions

Variables to represent the unknown

3.OA.A.3—Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

3.OA.D.8—Solve problems involving the four operations and identify and explain patterns in arithmetic.

How will this empower students?

Students will become aware of local organizations that help their community. Students will give back to their community. Students will apply algebraic thinking to a context they interact with.

To download this resource, visit the *Engaging With Culturally Relevant Math Tasks (Elementary)* Free Resources tab on the Corwin website or visit **https://bit.ly/3Lgv22E**.

PLAN

Select a task from your current curriculum/textbook. Use the template to revise the task to be more culturally relevant. How did the template help you think through the planning process? Is there anything you would change/add to the template to make it more useful?

The teacher adapted the task for students to learn about their own communities. This serves as a good example for beginning the process of implementing CRMTasks with children. Remember, the mathematics task is the chief means for how children will participate and experience mathematics in the classroom. Therefore, it is important to continually consider how to revise your current tasks to be more culturally relevant. This template is yet another tool to assist you in that process. It will be helpful to also continue to refer back to the CRMTask-building actions (Figure 3.1). The teacher selected a cognitively demanding mathematics task and centered the new task on students learning about organizations in their community. They targeted students' agency and social action by having them (1) decide on an organization to focus on, (2) decide on a fund-raiser, and (3) give back to their community.

As we have mentioned, tasks are foundational for the teaching and learning of mathematics. Therefore, starting with rigorous mathematics tasks that are culturally relevant will serve as the basis for culturally relevant mathematics lessons, units, and a cohesive, culturally relevant mathematics curriculum. In the next section, we share an example of how a teacher began by revising a mathematics task and then used that task to revise an entire unit to be more culturally relevant.

THE THREE-PART LESSON

The three-part lesson is predicated on the notion that students build powerful mathematical learning as they intentionally prepare to unlock mathematical thinking and experiences (*Launch*). They can then actively explore their ideas and strategies (*Explore*), and work with the teacher to build important understandings about their work and the work of others through dialogue, reflection, and extension (*Culminate/Congress*).

Launch
Teacher poses task and primes students' prior knowledge and interest

Explore
Students use strategies and thinking to explore mathematics tasks

Culminate/Congress
Teacher and students build and refine new understandings of student strategies and thinking through discourse and extension

Each of these stages provides opportunities for thinking about how to use CRMTasks. Tasks are not created in isolation of the overall lesson design, so it is important to reflect deeply on the kind of lesson structure into which you will be dropping tasks. Figure 8.2 offers how we expand the phases of three-part lesson planning to accommodate CRMTasks specifically and CRMT in general. We offer a CRT template in Figure 8.3 to give you a view of how the three phases might show up as part of a lesson plan.

FIGURE 8.2 ● Adapted phases of three-part lesson for culturally relevant mathematics tasks

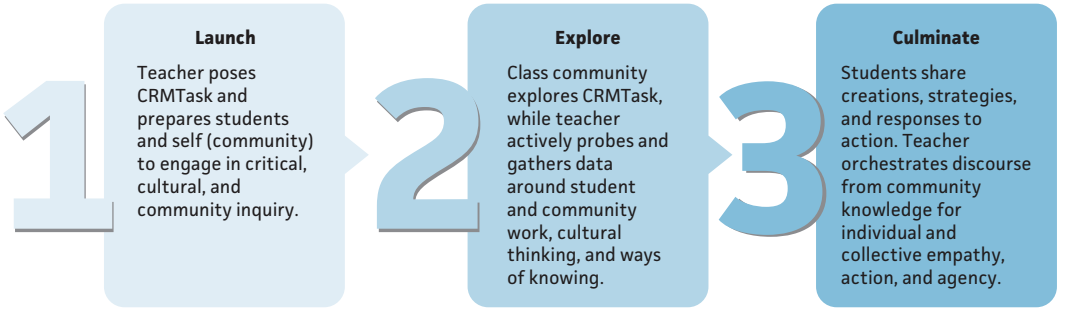
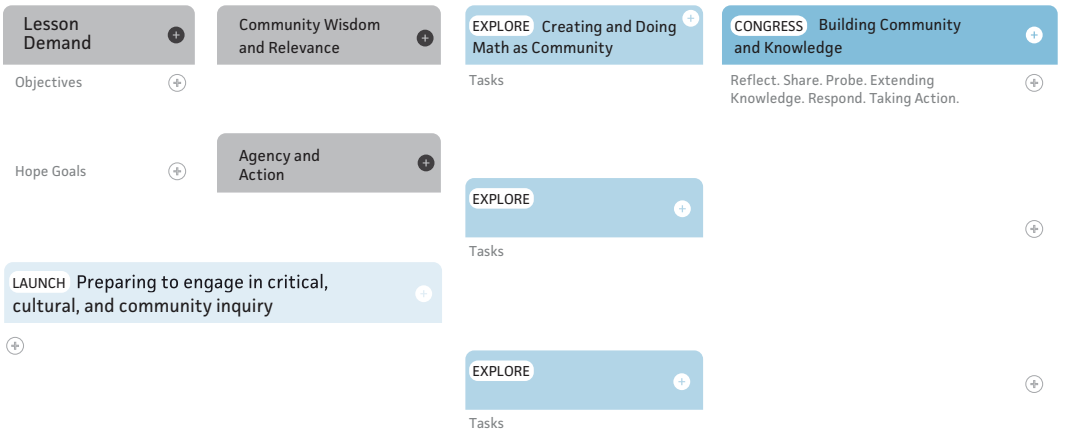


FIGURE 8.3 ● Culturally relevant teaching lesson template



LAUNCH

In the Launch phase of the three-part lesson, the teacher primes the learning by posing the task. For example, imagine a third-grade mathematics lesson where the teacher plans to lead students to graph, represent, and interpret data that they've collected from a previous activity. To launch, the teacher simulates a sample of collected data among students—for example, pizza choices. Students call out their favorite pizza toppings while the

teacher records their choices as tally marks. The ensuing discussions that take place with students are not only to determine differences in pizza choices, to help distinguish between similar but different choices, but also to determine what kind of graph might be needed to represent the data. Soon afterward, the students are turned loose at the end of the Launch to explore and represent data that they have collected previously, individually or in groups.

We see so much potential in the Launch to enact CRMT. Here, we ask teachers to actively consider not only to pose a relevant entry into mathematics activity but also to give strong attention to engineering the conditions for intellectual, cultural, and critical inquiry. In the sections below, we stress the importance of prepping the internal and external environments.

LEAN IN TO THE SOCIAL/CULTURAL ENVIRONMENT

Every day, communities experience joy, thriving, and celebration along with the challenges of economics, health, and discrimination. Leaning in at the onset of the Launch is key to centering and affirming the community/cultural space so that cultural and community inquiry can take place. What do we mean by leaning in? Leaning in is the act of becoming vulnerable for the purpose of empathizing and connecting with one's students and community. It's a hugely personal act, as illustrated by the example below.

Leaning in is the act of becoming vulnerable for the purpose of empathizing and connecting with one's students and community.

LAUNCH

Ms. V. takes some deep breaths from a stool in front of the class and shares a personal experience of growing up playing in a neighborhood field that is now slated to become an upscale mall. She then prompts students to think about how their own neighborhoods have changed for them and their parents, and to share their thoughts. After students share, they are then asked to calculate and compare the changing perimeters from a map of a local Washington, D.C., ward boundary from a decade earlier to the present time.

IMAGINE

How should you prepare for a Launch like this? What is the personal, emotional, intellectual prework that must be engaged in to be ready for this level of leaning in?

In the example above, Ms. V. leans in by centering a Launch onto a personal experience that is very emotional for her. She then draws students into the experience as they reflect on their own neighborhoods. From the very beginning, the lesson is established as being personal and community oriented.

MAKE SPACE

Too often mathematics is practiced as an isolated experience inside the walls of the classroom. It is important to ask yourself how you can make room for the community around you and acknowledge the land or the people in it. Teachers who value community and culture take the community/cultural pulse of place and mind regularly (if they are not already immersed in it) and focus on this orientation from the onset of the learning experience. For example, a teacher might make a point to acknowledge the real impact of the election of Vice President Kamala Harris for the Black and Asian communities and students in the class:

PLAN

Make a list of leading and probing questions that a teacher could use in this exchange with their students.

LAUNCH

Mrs. Jelks draws from the moment to amplify representation of African American women in politics with a brief notice and wonder session. In the session, she shows her students a chart depicting the demographic representation of local elected offices.

ASK

How do you "take the pulse" of what's happening in the community? What strategies would you use? Have a colleague give feedback on the potential merits and tensions of the strategies.

In the following example, the Launch leans into the public pulse around the *BLM* movement and is designed to engage students:

LAUNCH

Tamara displays an aerial photo of the newly painted BLM street mural near a Washington, D.C., school that has been dominating the local news. After probing student knowledge about the mural, which was painted several days before the class, the teacher prompts students to estimate how much space the mural takes up just by judging the photo. After fielding some estimates and reasoning from student estimates, the teacher then poses the task below.

Source: ©Washington.org. All rights reserved.

TASK

Estimate the surface area of the BLM mural. How much paint was needed for each word? The dimensions of the BLM letters are $2\frac{1}{2}$ *feet wide and 4 feet tall. Use these dimensions in your estimate.*

"EVERYONE, TAKE A SEAT": SITUATE LEARNERS AS CO-CREATORS

A key component of the Launch is the environment in which students are engaged in risk taking, collaboration, and knowledge construction. By sharing power and space, teachers intentionally situate the learner at the table of mathematics making. In launching tasks, teachers can provide opportunities for learners—and by extension the learners' community and cultures—by centering students as co-creators of both context and content.

LAUNCH

During Ms. Worthy's fourth-grade Launch, a student tells of a recent experience starting a neighborhood business during the summer, after which the teacher solicits others to share experiences where they have sold a product or service. Eventually, the teacher poses a task where students solve multiplication word problems and representations involving business applications.

CREATE

What are some examples of instances where you can create Launch spaces where students feel safe to use their voices and take risks? What are some things you can do to create a supportive environment for your students?

By creating space for students to share business experience, the teacher has created this space for immediate community inquiry and discussion. This "student and community inquiry" is critical for understanding and centering culture in knowledge construction. In this way, teachers build on informal and cultural knowledge.

There is an important tension to illuminate here. You may feel inclined to make this space exclusively about students, in the sense that students create for and by themselves. We do not believe this is the true intent of CRP. CRP is centered in multiple interlocking communities, which co-create together—the classroom, the family unit, the cultural community, the local community, and the global community. In this context, community itself can be defined as co-construction. In the classroom community, power is shared so that there are opportunities for students *and* teachers to create experiences and contexts that matter. The teacher's role is to guide this power sharing as both a designer and a facilitator. This is an opportunity to share—not surrender—the space so that students and their communities can engage in authentic inquiry.

In the classroom community, power is shared so that there are opportunities for students and *teachers to create experiences and contexts that matter.*

EXPLORE

In the *Explore* phase of three-part lessons, students have opportunities to *do* mathematics. When students explore, they utilize various strategies, communication, and tools to engage in the tasks. This part of the lesson phase is critical, and it's probably where the teacher learns the most about student understandings and misunderstandings. When students engage in this part of the lesson, they are *doing* mathematics because the teacher has chosen a task that requires enough cognitive effort such that students do not have an immediate solution strategy. Students may experience productive struggle during this phase because they are being asked to solve a problem that helps them to connect prior learning to new learning, not merely following a procedure.

The Explore phase is also a great time during the lesson to have students work collaboratively. This way, as the teacher circulates throughout the classroom, they will have the opportunity to observe students' written work and listen to students' thinking through their conversations. We also see exploration as a time for listening and learning culturally. This is important for CRT because the teacher can continue to build on what they learned about students and community in the Launch phase. It is important here to ask questions that build on and extend students' prior knowledge. By doing so, the teacher is helping to build students' identity as a doer and producer of mathematics. When students are appropriately engaged during the Explore phase, they begin to feel empowered, and this leads to building student agency.

Teachers are asked to record and collect data on what students do and how they think and use strategies to solve challenging problems, such as in the example below.

EXPLORE

Eloria introduced a hopscotch skip-counting activity to her second-grade class where chalk boxes drawn on the classroom floor were labeled by twos and fives, and students were asked to jump them. She noticed on the first day that several of her students were able to count by 5's to 100 already, some of them counting to a rhythm with one student banging out a beat on his desk. She asked one student where he learned how to count by 5's. The student responded that when they play "Hide and Seek" during recess, whoever is "It" counts 5 … 10 … 15 … 20 … to 100 and then says, "Ready or not, here I come!"

The example on the previous page shows the teacher noticing counting patterns, but it also gives great insight into what cultural noticing looks like. A close inspection reveals that there is a playground connection to skip counting for the children that the teacher recognizes. For teaching using CRMTasks, we extend the notion of "noticing" and "recording" to ask teachers to think intentionally about the many ways in which cultural thinking is showing up. Note that *cultural* thinking is used here in place of *informal* thinking to emphasize the importance of deliberately attending to notions of cultural ways of knowing, affirmation, celebration, and solidarity. This speaks to the biggest challenge we see for aspiring teachers of CRMTasks in that teachers do not invest enough in what Ladson-Billings (1994) calls "mining." Teachers are often limited by lack of knowledge, lack of will, and bias. We challenge you here to consider questions like, "Why is this problem strategy important to ***us?***"—with emphasis on the "us." When engaging with students as they do mathematics, you can ask yourself, "In what ways are community ways of knowing affirmed, validated, or celebrated through the use of this particular response to the problem?"

CULMINATE/CONGRESS

In the culmination part of the lesson, the teacher utilizes the collected data about student thinking, strategies, and understandings (and misunderstandings) acquired in the Explore phase. These data are used to facilitate active discourse during which students can make sense of their ideas and refine them in new and more sophisticated ways. Using CRMTasks we can extend this to create space for students to share co-creations, strategies, feelings, empathy, and responses to action. For example, extending the *Explore* example from the previous page, the teacher might realize the importance of playground and cultural activity in skip counting and wish to find out more information in the Culminate/Congress phase. As a result, the teacher and class can learn more about what the children are singing at home and traditions that are important to them that might emphasize counting.

In the following first-grade example, a teacher has created a task that utilizes skills and knowledge students have acquired over the course of a lesson, as well as integrating insight the teacher has gained about the students and community during that time, resulting in an exercise that exemplifies the culmination phase of the three-part lesson.

CCSS.MATH.CONTENT 1.G.A.1.

Reason with shapes and their attributes. Distinguish between defining attributes (e.g., triangles are closed and three-sided) and nondefining attributes.

CRMTask: What makes your community special?

Make a list of the shapes (up to five) in the selected community. Describe the shapes and say how this shape reflects the beauty of the community. Write the descriptions in the correct column.

The teacher started by reading to her class the book *Shapesville* by Andy Mills and Becky Osborn (2003). The class then had a discussion about communities they are part of and made a list together of the various communities' attributes (possible communities to focus on are family, school, place of worship, neighborhood). After discussing each community and its attributes, the class listed all the shapes that they find in the home, at school, and in the neighborhood. For the culmination, the class chose one community and named all the shapes they could see there, and then listed their attributes. The goal here is to highlight the mathematics in students' communities and to provide an opportunity for students to express what makes that community important/special to them.

We have found that the culmination stage of lesson planning is a great time for teacher reflection and self-assessment, and a space where they can redirect the lesson if there is a disconnect between the cultural context and the mathematical context. Teachers can ask themselves, "Is the prompt strong enough by itself?" "Do I need to ask a question in the next phase?" "How is culture useful here?" "How do I connect this aspect of culture to this mathematical idea and possibly future mathematical ideas?" "What more do we have to learn about this particular cultural activity?" Here, ways of knowing can be honored in similar ways as were identified in the Launch, creating an opportunity to bring the cultural learning experience full circle. We add some additional scenarios below:

CULMINATE/CONGRESS

Ms. Phaire's lesson launches an activity where her students measure selected common objects using a ruler to understand the measurement process and the need for standard units. During the Explore session, one of her students remarks how her uncle who is a carpenter used a ruler and several tools in building the outdoor deck for their house. During the Congress, Ms. P. pivots the conversation to discuss carpentry tools and asks her student to invite her uncle to class. Ms. P. continues to probe other possible uses of rulers in her students' community.

You can see from the example on the previous page that the Congress is a great opportunity to reconnect or connect the mathematical activity back to cultural knowledge and inquiry, particularly if opportunities have been missed earlier.

The culmination session is a place to look for climaxes, where students' understanding of new mathematical cultural ideas comes to a shared point of understanding. An example might be the moment when students, having used multiple strategies to analyze the prices of houses between differently zoned neighborhoods, collectively begin to connect such price growth with ideas on gentrification. The teacher laid the foundation and asked the right probing questions to lead the students to organically arrive at an understanding of how mathematics relates to social justice issues in their community.

CULTURALLY RELEVANT MATHEMATICS CURRICULUM UNIT

As with any new strategy, one must have practice. Teachers can start that practice by revising existing mathematics tasks to be more culturally relevant. They can then move on from thinking about a task to thinking about an entire lesson, during which they must think through the beginning (Launch), middle (Explore), and end (Congress) of the lesson. Traditionally, we know that any lesson must begin with a goal, mathematics standards, lesson objectives, cognitively challenging mathematics tasks, and assessment procedures. In addition, teachers must plan by providing a list of materials, anticipate student solution strategies, propose ways to address misconceptions, think of questions to elicit student thinking, orchestrate classroom discourse so that students make sense of the mathematics, and decide on instructional strategies that balance students' procedural and conceptual understanding of the mathematics. In our lesson plan template for culturally relevant mathematics, we refocus teacher thinking to begin with a goal that is centered on cultural and community knowledge.

When moving onto the next step of writing entire units, teachers are tasked with zooming out and looking at a larger picture than a single task or lesson. They must use knowledge of their students and community and decide on a larger social justice goal to unpack for a unit. In doing this, they learn that just as cognitive demand would vary throughout a unit, so would cultural relevance. Although the unit's larger goal may have a social justice focus, teachers should also be aware that the objectives for each lesson would vary in the level of cultural relevance. Some lessons might

be focused more on a mathematics objective, others might focus more on community values, while still others might be more balanced with mathematics shining the light on a community/cultural value. In the end, the unit should answer the question of how students will experience agency by using mathematics as a tool to understand and act on an issue that is important to them individually or collectively in their community or in the world.

Below is an example of an exercise given to graduate in-service teachers. They were asked to design a culturally relevant mathematics unit either from scratch or modified from an existing unit in their curriculum. The teachers provided a summary of their unit, a description of each lesson in the unit, and the unit assessment. They were also asked to include a context for each lesson as well as instructional strategies aligned with the literature on CRP. To assist with their planning, they were asked to describe the level of cultural relevance for the unit and a rationale using the CRCD mathematics task rubric (Figure 3.2) as well as the readings they did on CRP and social justice mathematics.

SUSTAINABILITY GARDEN UNIT: CULTURALLY RELEVANT MULTIPLICATION AND DIVISION THROUGH GARDENING

Goal: Students will demonstrate their knowledge of multiplication and division through various representations. Students will apply their knowledge through real-world applications and problem solving to create a community garden that is relevant to the location and the population that lives within it. [CCSS: 4.OA.A.1, 4.OA.A.2, 4.OA.A.3, 4.NBT.B.5, 4.MD.A.3]

Lesson 1: The teacher will set the stage of the new unit by relating it to the overall topic on the school garden. Students will explore the variety of leaves in the garden at the front of the school. They will trace the outline of a leaf and determine its measurement on the outside and inside from the tracing. Then, they will analyze and compare the two types of measurements and arrive at the definitions of perimeter and area.

Lesson 2: Students read the book *Seedfolks* by Paul Fleischman (1997). This book takes us to the heart of the city of Cleveland, and a neighborhood that has seen better days. It's filled with people who are mostly immigrants. They live in close proximity but barely share more than an occasional hello. They all stay in apartments around an empty lot that, in the course of this story, is transformed from a smelly junkyard into a lush community garden. Students explored the formula for perimeter and determined the perimeters of garden beds in the front of the school building.

Lesson 3: Students continued their exploration of area as they were introduced to the area model of multiplication. They explored area through the use of graph paper and found the area of raised garden beds outside of the school building.

Lesson 4: Students read the book, *The Great Divide* by Dayle Ann Dodds (2005). After reading the book, students had to demonstrate an understanding of the area model of division as it related to the book and previous studying of area and decomposing numbers. They also applied this knowledge by using their area and perimeter of the plot of land with a set square footage and decomposed the section of land to create smaller garden plots for different crops.

Lesson 5: Students researched areas in the city that were open and created proposals for the mayor to create community gardens. Their proposal was to include the location of the garden with area and perimeter as well as a decomposition of the plot with beds and seeds that would best grow in that area.

Lesson 6: Students read the book, *The Boy Who Loved Math: The Improbable Life of Paul Erdos* by Deborah Heiligman (2013). In this book, most people think of mathematicians as solitary, working away in isolation. Paul Erdos never followed this path. At the age of four, he could ask you when you were born and then calculate the number of seconds you had been alive in his head. Students investigated crops that grow in a particular region and climate to establish a garden that will be able to sustain year-round. Students created a timetable of when to harvest the crops and how they will be able to provide to the public school system lunch program. Students connected to Paul Erdos and demonstrated their understanding of multiplication in order to form production of crops over a period of time (week, month, growing season, year, etc.).

Lesson 7: Students discussed information they learned about the produce that is available in local grocery stores across the city. Students looked at flyers and mailers and compared prices of the same items across the stores. Students made a chart comparing these prices and discussed why this might be.

The Assessment Task is called The Garden Sustainability Problem. It says, the city is planning to develop a community garden to strengthen the sustainability of food provided to the public school system and they need your help. The city has enough space for an 800-square-foot garden. Help plan the garden shape and sections for different crops. Use your reasoning of area and perimeter to justify why you choose these measurements. Also, draw on your knowledge of what crops would grow best with our regional climate from previous lessons and discussions. Plan out sections within the garden to grow crops separately. How many crops will you grow and what will be the size of each section? Explain why you chose this plan and how your crops will help sustain produce in schools. Last, you will need to protect your garden with a fence. How much fencing will they need for the outside of the garden? If fencing costs $12.25 a square foot, how much will the fence cost?

In creating this unit, the teacher, Mr. Gould, used several of the strategies we've shared throughout the book. He thought about how to make real-world connections between the mathematics of the original unit and his students. The neighborhood where the school is located is considered a food desert, which is an area that has limited access to affordable and nutritious food. Although there are seasonal pop-up farmer's markets in the city, they are usually not within walking distance of this neighborhood. For this reason, Mr. Gould decided to focus on having the students learn about how they could help their community's sustainability through a community garden of healthy vegetables.

In Chapter 6 we talked about how children's literature could be used to make connections between mathematics and the real world and to help students see themselves reflected in inspiring stories. Mr. Gould learned that using resources such as children's literature, media, and visuals is an effective way to make connections to students' experiences or to teach them about empowering figures (both real and fictional). Mr. Gould selected children's literature that would help students understand that their neighborhood, like the one in the book they read, had seen better days. It is important for students to know the history of their community and the possibilities of a brighter future for the community. Mr. Gould also connected to students' agency by having them research their city for open areas where they could create community gardens.

Although he had students create proposals about the gardens with the intention of giving them to the mayor, it seems that he stopped short of having the students actually send their proposals. Recall Anchor Standard #20 from the SPLC's Learning for Justice Standards:

> *Students will plan and carry out collective action against bias and injustice in the world and will evaluate what strategies are most effective.*

We believe that Action is a necessary step in building Agency for students. This agency can be nurtured by inviting the students to discuss this step and decide on the best way for collective action. This would also be a great place to involve parents, families, and the community.

Mr. Gould had several missed opportunities in planning his culturally relevant mathematics unit. For example, in the assessment he seems to create a fictitious scenario of 800 square feet that the city has for a community garden. Why not have students use the information they learned throughout the unit?

Using students' authentic information will help them to see the real-world connections of the mathematics they are doing, and how they can use mathematics to change something that is problematic into something that can bring the community and school more joy. Another missed opportunity is not mentioning how to engage parents, families, and the community. Looking back at Figure 5.1 (Approaching Cultural Inquiry From a "We" Perspective), we can see that this unit really does address the idea of *We Respond,* especially if the students get their families and community involved in the community garden. By including the community in the planning of the garden, students will recognize that something they learn in school can model "care, love, and respect" for their community. The city has excluded this community in recent revitalization efforts, but by completing this unit, the students can see that they can make a difference in their own community.

The flow of this unit started with a big idea (community sustainability). Once the teacher had his idea, he thought about how children's literature might bring the idea to life. With a big idea in mind and possible resources, the teacher had to align his idea to grade-level mathematics content standards. The idea of creating a community garden aligned well with his fourth-grade standards related to area and perimeter. Appropriate timing plays a part in building a unit, so Mr. Gould thought about individual lessons where subsequent lessons would build on previous lessons making sure to have just enough content for students' deep learning of the mathematics. The closure should include a product that points back at the big idea, which is learning something about the community and taking action, using mathematics as a tool.

IMPROVE

Choose one of the lessons from the culturally relevant mathematics curriculum unit in the previous pages and discuss how the Launch, Explore, and Culminate processes might play out in the classroom.

Teachers can be successful when they are provided the tools and opportunities to create CRMTasks, lessons, and units. The process of learning about and creating CRMTasks is an ongoing process—a journey that you will take throughout your entire teaching career. Task creation is just one aspect that we hope you feel confident in tackling at this point, which includes skills you can apply to all aspects of designing culturally relevant lessons and units.

Summary and Discussion Questions

This chapter further explored CRMTasks by introducing the Revising a Math Task to Be Culturally Relevant Template. We then brought together what we have discussed regarding CRMTasks in earlier chapters to implement in a lesson plan, using the three-part lesson format—Launch, Explore, and Culminate/Congress. In the Launch we presented in this chapter, the "lean in" came from a personal experience of the teacher, which is just one of many ways to engage authentically with one's classroom. A key component of the Launch is the environment in which students are engaged in risk taking, collaboration, and knowledge construction, where the teacher and the student become co-creators of context and content. In the Explore phase, students utilize various strategies, communication, and tools to engage in the tasks. In this part of the lesson, teachers learn about student understandings and misunderstandings, and together they determine an answer to the question—Why is this problem strategy important to *us*? Finally, in the Congress/Culmination part of the lesson, the teacher utilizes the collected data about students acquired in the Explore phase to facilitate active discourse during which students can make sense of and refine their ideas, creating space for students to share co-creations, strategies, feelings, empathy, and responses to action. This approach to lesson planning is invaluable in planning whole curriculum units, as illustrated in the example Culturally Relevant Mathematics Curriculum Unit included in this chapter.

For the following questions, start with a task that you have been revising to add to a full lesson and think through the questions as you create a three-part lesson plan.

1. What is a "culturally neutral" concept that you can replace with a more culturally relevant and community-minded idea, and how can you personalize it in a task to use as the "lean in" to launch your lesson?
2. In the Explore phase, think of how you can deliberately attend to notions of cultural ways of knowing, affirmation, celebration, and solidarity. Give a few examples.
3. In the Culminate/Congress phase, can you think of a time when knowledge of your students' community helped redirect or bring back the cultural context during a mathematics task? What was the disconnect with the original mathematical context? What questions do you think are helpful to guide this redirecting or reconnection?

CHAPTER 9

Continuing the Journey

In this chapter we will:

- Summarize key elements for designing culturally relevant mathematics tasks
- Highlight critical areas for the development of teachers for creating culturally relevant mathematics tasks

Becoming proficient at creating tasks for CRMT is just the start of a lifelong journey for a teacher. There will likely be starts and stops, as well as successful and challenging moments. Now we will look back on the earlier work in this book to reflect on key points and give our last advice on handling the day-to-day challenges of continuing this journey.

REFLECTING ON KEY ELEMENTS

In Chapter 1, we explored expectations for modern mathematics and fundamental ideas about CRT to begin the journey to engage children in CRMT. CRMT shares three important ideas for mathematics teaching:

1. Students deserve access to mathematical challenge, desire, thriving, and promise as a baseline—not a ceiling.
2. Who students are—that is, their culture and community—is central to their mathematical identities and experiences.
3. Children thrive when mathematics experiences shape their lives and empower them to respond with empathy and agency.

In Chapter 2, we introduced you to CRMPractices, which together with CRMT paint a picture of mathematics learning where

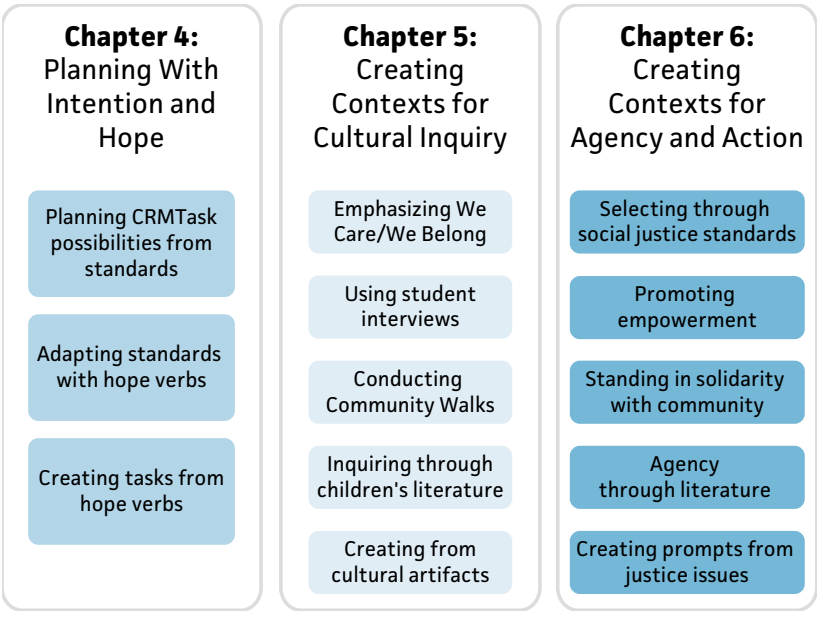
learners thrive and find voice and meaning in the mathematics that they do.

In Chapter 3, three task-building actions for CRMTasks were framed as the key work in making CRMPractices a reality for children. These actions form the heart of design work for CRMTasks: establishing demand (Demand), centering community and cultural inquiry (Relevance), and targeting empathy, agency, and action (Agency) (Figure 3.1).

We also introduced a rubric to support how the dimensions of demand, agency, and relevance can be assessed by teachers (Figure 3.2).

In Chapters 4, 5, and 6, we described and illustrated 13 specific approaches for planning and designing CRMTasks (Figure 9.1). The process involves planning with intentional goals for creating hope and centering relevance and agency. The process also involves attending to students' culture and community using our "We Care/We Belong" approach, which is essential to nurture authentic relationships with your students. In addition to accomplishing this through your daily interactions, teachers can conduct a student interview, create contexts using cultural artifacts, or take a community walk to determine funds of knowledge in your school's community. We shared some strategies for creating context of supporting community aspirations and creating prompts in solidarity with emerging social and racial justice issues.

FIGURE 9.1 ● Thirteen specific approaches for planning and designing culturally relevant mathematics tasks



In Chapter 7, we shared our work and lessons learned from how teachers view CRT, as well as tools we and others have created along the way. In Chapter 8, we discussed how you might frame the common teaching approach called Teaching Through Problem Solving through the lens of CRP. Finally, we shared a template for revising existing tasks to be more culturally relevant, and we included an example of how one can integrate CRMTasks in lessons and curriculum units.

KEYS TO CONTINUING THE JOURNEY: HOPE BY DESIGN

We started off by saying that we see teachers as engineers, and we would like to emphasize that again. Teachers are engineers capable of designing—and refining—engaging, inspiring, and empowering mathematics learning experiences for their students.

So how can we continue the work of CRT and the design of CRMTasks? Teachers are challenged at every phase of the work of design, whether it's planning, creating, improving, or implementing. Throughout the book, we have sought to engage the reader with engineering verbs to aid in developing a design mindset: *ask, imagine, plan, create,* and *improve*. Furthermore, we extended the conversation to talk about what happens when teachers continue on a journey in which they will have to continually ask, imagine, plan, and create an improved mathematics task for the children they teach. It is helpful to get in a proactive mindset, anticipating what issues and problems might arise, and using the tools and skills at your disposal to respond skillfully.

ONE TASK AT A TIME

Sometimes when people start this journey, they want to look at entire units and lessons. That's fine, but the truth of the matter is that it is often more manageable to take it one task at a time, one question at a time, one problem at a time, one prompt at a time, one context at a time. That is, it's okay to start small. In fact, it is often wise to start with reasonable goals and build up from there, especially if this is all new to you or you are just starting out. We are constantly amazed at how one task—just one task—causes us to think deeply about things like cognitive demand, the power of cultural inquiry, or the extent of critical consciousness. In each task there exists a world of possibilities.

In each task there exists a world of possibilities.

OPEN UP YOUR PRACTICE

When you begin to teach in a way that utilizes tasks that students might find interesting or engaging, the classroom and extended community change, whether these are tasks that they create themselves or tasks that you create in collaboration with them. One of the telltale signs of success will be the way in which they begin to discuss these experiences. Open up your practice to feedback from students directly and from community members at large. When you invite feedback and hear it with genuine care and consideration, people will be more willing to discuss and talk about things that relate to them and that are relatable to them. Some of the examples included in our book have been based on the feedback we have received from children and from their teachers. This feedback can range from topics that are critical to them to their definitions of CRT or culturally relevant mathematics. It's important because it helps us to adjust how we are implementing and creating tasks so we can ensure we are doing so with the utmost respect for the communities we serve.

When you invite feedback and hear it with genuine care and consideration, people will be more willing to discuss and talk about things that relate to them and that are relatable to them.

JUMP IN AT THE DEEP END

Something that continues to come up in our practice and in our everyday life is that it is impossible to do this work without centering and immersing oneself into the culture and community of the people one teaches. The obvious reason is that by doing this, you will continue to build a treasure trove of cultural knowledge. However, the most important reason is that you develop a symbiosis with the community that you're seeking to understand through deep relationships. It is through the presence of authentic relationships that the design process we've outlined, particularly the imagining, is most profoundly expressed. When we are connected with our children, we are able to see what they see. We can imagine contexts *for* and *with* them to drive our mathematics. In doing so, we are also more open to the contexts they create and imagine. We become more trusting of the mathematics embedded in their culture and community and we build an empathetic relationship with those communities.

PREPARE TO ENGAGE YOUNG CHILDREN IN SOCIAL JUSTICE

The main places where teachers get stuck when designing CRMTasks are understanding where the issues come from and discerning what might be appropriate for young children to learn. Young children deserve to learn mathematics in ways that shape their lives and the lives of those around them. But we acknowledge that engaging young people can be a source of unease for you. We see at least four checks to carry out before beginning to engage in social justice work.

Keys to engaging children:

1. Start with familiar topics
2. Scan community organizations
3. Ensure parent and school permissions
4. Check personal bias and deficit mindsets

Think about it. Children learn pretty early that mathematics experiences are either playful on one hand, where games are played, marbles are counted, pizza is divided, and candies given away. This often results in trivial problem sets and word problems that make no real sense (e.g., Fran purchases 21 chocolate bars. If Fran gives away 6, how many does she have?). One way to begin to engage is to begin with familiar topics and approaches and gradually "problematize" the context and prompt to shift toward challenges of fairness, equity, and justice. We also suggest that you perform a community pulse check to gain better awareness of, and appetite for, pursuing justice topics. Communities have readymade aspirations for justice work, and it often means tapping into local change networks—nonprofits, government agencies, places of worship, social groups, and so on. You are not alone, nor solely responsible for "bringing justice."

We see so many teachers struggle in isolation with ethical questions and their discomfort in having these difficult—and necessary—conversations. We prioritize this for mathematics teaching because of the imbalance in racing toward the end goal of abstract mathematics tasks ("naked math," as we call it, or those with "neutral" mathematics contexts) for young learners. Our advice is to get support from existing curricula and standards guides and the various organizations that have developed guidance for having social justice conversations.

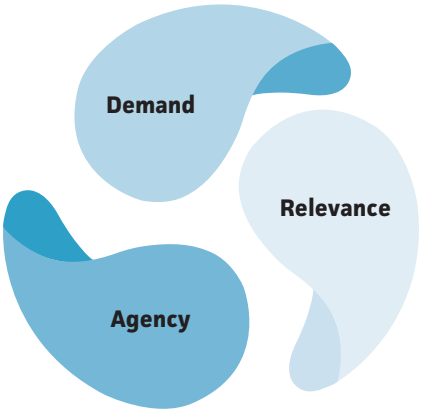
It is also important not to forget the role in which parents and community have featured in our work around CRMTasks. Parents also play an important part in considering what they want

children to learn and do in school. Understanding how parents feel about current issues and what they see as critical, and challenging, topics and issues to learn is critical. We hope that you see mathematics teaching as a partnership where parents and community can inform—even guide—what is important to explore, respond to, and challenge.

Although not altogether the focus of this book, we acknowledge that far too many teachers approach thinking about culture, justice, and community in deficit ways. That is, as teachers, we often place ourselves outside of communities and see our work as fixing something deficient. We also believe that all teachers hold potentially damaging biases (e.g., believing rap music is a default way to engage Black children). These biases must be checked openly in the planning and reflecting process.

ROUND AND ROUND: SEEING CULTURALLY RELEVANT PEDAGOGY AS CIRCULAR

Our definitions and frameworks—the ways in which we interpret and apply CRP—continue to evolve. Take, for example, our rubric for creating cultural mathematics tasks (Figure 3.1). There is almost a linear feel to it: Demand → Relevance → Agency. One teacher interpreted this as "I need to start on Demand and end up with Agency." However, as we grow, we continue to think about CRMT as a nonlinear process where the elements of Demand, Relevance, and Agency work together in ways that sometimes make it difficult to distinguish between them.



While we do believe that high cognitive demand ought to be a baseline indicator of work in CRMTasks, it is rare that we see tasks that are strong in every dimension. For instance, there are situations where current events and pressing issues of racial injustice may provide an opportunity for creating a task;

the improvement work needed may be to strengthen the mathematics demand substantially. This might be considered an Emerging task. The same may be true with tasks that begin in an interesting pursuit of cultural inquiry but that may require improvement in both demand and agency. Some tasks may have strong elements of cognitive demand as well as cultural inquiry but may lack a context or prompt that allows students to experience critical agency. While there is a tendency to see the latter example as Exemplary, the omission of agency is harmful to the overall work for CRP. When we think about CRMTasks in this way, our advice to teachers is to start where you are comfortable and work from your strengths to improve and refine the other elements of the task. What matters most is that you are approaching this important—and often difficult—work with a spirit of caring, curiosity, empathy, and open-mindedness.

Above all else: embrace the journey.

Discussion Questions

You have been on a journey with us throughout this book, digging deeper into CRMT and CRMPractices to build CRMTasks to enhance your lessons, instruction, and your students' experience with mathematics. It's a lot of information to take in, and we encourage you to look back at the book often to reacquaint yourself with the tools and insights offered here. As you reflect on all you have learned, consider the following:

1. Describe some ways in which your understandings about teaching mathematics and engaging communities have shifted since engaging in the activities and questions throughout this book.
2. Where do you rate yourself on the journey to fully utilize CRMT and tasks as a part of your teaching? What do you see as strengths? Where might you grow?
3. What possibilities of fostering hope in the mathematics experiences of young children do you see? How can you build and grow a movement of teaching change that draws on hope as a source of mathematics teaching where you are? Describe what critical next steps you see in your development as a practitioner of CRMT. What are some plans you can make for the future to further expand the critical-, cultural-, and community-mindedness of your teaching?

Resources

1. The Southern Poverty Law Center's website, Learning for Justice (www.splcenter.org/learning-for-justice), provides excellent guidance on several topic areas such as Race and Ethnicity, Religion, Ability, Class, Immigration, Gender and Sexual Identity, Bullying and Bias, and Rights and Activism.
2. Resources for including diverse mathematicians in math tasks/lessons/units:
   a. Mathematically Gifted & Black (https://mathematicallygiftedandblack.com)
   b. Lathisms (lathisms.org)
   c. About Us—Indigenous Mathematicians (indigenousmathematicians.org/about-us)
   d. Mathematicians of the African Diaspora (updated) (www.mathad.com/home)
3. Rethinking Schools—Bringing more critical voices into the conversation about public schools and libraries (https://rethinkingschools.org/)
4. Resources for more information about the Ishango Bone:
   a. Mathematical Association of America: Mathematical Treasure: Ishango Bone (www.maa.org/press/periodicals/convergence/mathematical-treasure-ishango-bone)
   b. Mathematicians of the African Diaspora: An Old Mathematical Object (the Ishango Bone) (math.buffalo.edu/mad/Ancient-Africa/ishango)
5. Selected children's literature:

NO.	BOOK TITLE	AUTHOR
1	*Bowwow Powwow*	Brenda Child
2	*Hair Love*	Matthew A. Cherry
3	*Hidden Figures (Young Reader's Edition)*	Margot Lee Shetterley
4	*Jingle Dancer*	Cynthia Leitich Smith
5	*Just Ask: Be Different, Be Brave, Be You*	Sonia Sotomayor
6	*Malala's Magic Pencil*	Malala Yousafzai

(continued)

(continued)

NO.	BOOK TITLE	AUTHOR
7	*Nelson Beats the Odds*	Ronnie Sidney II
8	*Salt in His Shoes*	Deloris Jordan
9	*Sulwe*	Lupita Nyong'o
10	*The All Together Quilt*	Lizzy Rockwell
11	*The Boy Who Harnessed the Wind*	William Kamkwamba and Bryan Mealer
12	*Two of Everything*	Lily Toy Hung
13	*Viva Frida*	Yuyi Morales
14	*What Was Stonewall?*	Nico Medina
15	*Women Who Count: Honoring African American Women Mathematicians*	Shelly M. Jones

Appendix A: Revising a Math Task to Be Culturally Relevant Template

Goal: Describe the current state of your task and your desired movement on the CRCD math task rubric (Emerging to Developing to Exemplary).	
Original task (should be a cognitively demanding task)	Revised CRMTask
Why did you choose this task? What aspect of the task was the focus? (Mirror/window, funds of knowledge, social justice, mathematics content is CR friendly, etc.)	
Using the CRCD math task rubric, describe how the mathematics task was revised.	
Math content	How will this empower students?

To download this resource, visit the *Engaging With Culturally Relevant Math Tasks (Elementary)* Free Resources tab on the Corwin website or visit **https://bit.ly/3Lgv22E**.

Appendix B: List of Tasks and Math Content Standard With Grade

CCSS	PROBLEM CONTEXT AND MATH CONTENT	PAGE
4.OA.B 6.NS.B.4	Versions A and B: Dylan's mother drives to work. Factors and multiples	p. 6
5.NF	Diego and his friends eat cake. Figure 2.1. Word problem structure of a mathematics task Multiply fractions	p. 19
4.OA.C	Handshake problem: multiple entry point problem that allows students to engage at different levels. Problems can be reengineered to support cultural inquiry. Generate and analyze patterns	p. 26
5.NF	Mom makes a holiday custard. Multiplying/dividing whole numbers by fractions	p. 29
3.NF.A	No context Comparing fractions by reasoning about their size	p. 36
3.OA.C.7	Number of bananas in a bag Multiplying within 100	p. 37
4.NF.B.4b	Barbershop owners Multiplying whole numbers and fractions	p. 38
4.NF.B.3d	Volunteer project: students mow lawns for senior citizens. Adding and subtracting fractions	p. 38
5.NF.B.7c	Cooking using a recipe Measurements using fractions; adding fractions	p. 38

CCSS	PROBLEM CONTEXT AND MATH CONTENT	PAGE
4.NF.B.3d	Naked fraction problem vs. cultural context problem: Yuki makes a Japanese kimono. Adding fractions and mixed numbers	p. 39
2.OA.A.1	Beth and her chest of coins vs. Beth's neighborhood bicycle group: an example on how to enhance a mathematics task by giving the problem personal and community relevance	p. 40
3.MD.C	Miss Kelly purchases carpet. Area and perimeter	p. 43
3.OA.C.7	Styrofoam lunch trays: environmental concern/recycling Multiplication, area, and perimeter	p. 44
2.NBT.B.8	Chelsea's Charity donates art kits to children and adults in need. Charts, tallying, reasoning, addition up to 100	p. 44
3.MD.C.7.B	Measurement and data	p. 50
3.MD.C.7.D	Arlen makes a patio for his grandmother's backyard. Shapes and area ("square foot")	p. 52
3.MD.C.7.D	Father makes a chicken coop for his daughter to raise chickens. Dimensions and area	p. 52
1.NBT.B.3	Students tally fair and unfair episodes that happen in a day at school. Place value, compare numbers	p. 59
3.OA.A.4	Aiden's grandfather has a vegetable garden. Multiplication using arrays	p. 60
3.G.A.1	Eva's fireplace design Analyzing patterns and adding/subtracting perimeters	p. 60
3.MD.B.3	Belén's cafeteria food choices Represent and interpret data	p. 61
1.MD.A.2 2.MD.A.1	Using centimeter cubes to measure the length of an object. Measure length indirectly (grade 1) Measure and estimate length (grade 2)	p. 65
3.OA.D.8	The Parkers organize a family trip to the Black Cowboy Museum Writing an equation that can represent the stated scenario	p. 65

(continued)

(continued)

CCSS	PROBLEM CONTEXT AND MATH CONTENT	PAGE
5.OA.B	Nia's family reunion Calculating averages using data on a table	p. 67
3.MD.B.3	Empowering students on the issue of bullying: collecting data via surveys and creating a supporting graph to represent the data collected. Represent and interpret data	p. 84
5.NF.B.6	Original Task (painting an office building) vs. Improved Task (painting neighborhood fences) Multiplying fractions by whole numbers	p. 85
4.MD.A	Libby makes masks for people in her community. Measurement and multiplication	p. 88
1.OA.B.4	The school will install internet towers in the community to provide wifi for students and families. Understand subtraction as an unknown-addend problem	p. 89
5.NBT.B.7	Dumping of rooftop shingles near a community. How to properly recycle and clean up the mound of trash. Add, subtract, multiply, and divide decimals.	p. 90
1.MD.C.4	Paper Navajo beadwork strips. Organize, represent, and interpret data with up to three categories.	p. 103
5.NF.B.6	Making a special recipe Fractions, decimals, and measurement	p. 103
5.NF.B.6	Black Lives Matter street mural in Washington, D.C. Surface area	p. 111
1.G.A.1	What makes your community special? Students create a table that includes shape, defining attributes, and nondefining attributes of shapes they find in their community. Reason with shapes and their attributes. Distinguish between defining attributes (e.g., triangles are closed and three-sided) vs. nondefining attributes.	p. 115
3.OA.A.3	Students will generate fund-raising ideas for selected community organizations in their city. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities.	p. 107

CCSS	PROBLEM CONTEXT AND MATH CONTENT	PAGE
3.OA.D.8	Students will determine the amount of money and the length of time needed to raise funds for a community organization. Solve problems involving the four operations and identify and explain patterns in arithmetic.	p. 107
4.MD.A.3	Lesson 1: Measuring different aspects of leaves Perimeter and area	p. 117
4.MD.A.3	Lesson 2: Measuring flower beds in front of the school Perimeter	p. 117
4.OA.A.1	Lesson 3: Determining the area of flower beds in front of the school Area	p. 117
4.NBT.B.5	Lessons 4 and 5: Decomposing an area of land to create smaller garden plots for different crops Multidigit multiplication using an area model	p. 118
4.OA.A.3	Lesson 6: Producing crops over a period of time to supplement the school lunch program Solving multistep word problems using the four operations	p. 118
4.OA.A.2	Lesson 7: Comparing grocery store prices for produce across the city Multiply or divide to solve word problems involving multiplicative comparison	p. 118

Glossary

TERM	DEFINITION	PAGE
Academic success	The intellectual growth that students experience as a result of classroom instruction and learning experiences	p. 9
Critical agency	The ways in which mathematics experiences require students to respond with empathy, stand in solidarity, explore social issues of justice, and take action	p. 40
Critical consciousness	Involves being able to look critically at knowledge, school, and society with regard to how each has been used throughout history to miseducate, dominate, and marginalize one group of people at the expense of another group	p. 9
Cultural competence	The ability for students (and teachers) to appreciate and celebrate their cultures while gaining knowledge of other cultures; the ability to help students gain fluency in at least one other culture	p. 9
Cultural contexts	Settings and situations in which mathematical tasks are embedded and are given for the purpose of assisting learners to draw from hopefully familiar referents when tackling mathematical ideas	p. 19
Culturally relevant mathematics task (CRMTask)	A math task that involves (1) a high cognitive demand, (2) where culture and community are the source of math inquiry (relevance), and (3) where individual and collective agency are the intentional outcomes (agency)	p. 31
Culturally relevant pedagogy (CRP) or culturally relevant teaching (CRT)	Describes how teachers utilize culture and community to empower students intellectually, socially, emotionally, and politically (Ladson-Billings, 2009)	p. 9

TERM	DEFINITION	PAGE
Funds of knowledge	The knowledge that students acquire outside of school and already have, based on cultural practices that are a part of their families' cultures and traditions as well as their parents' work experience and what they do in their daily routines	p. 46
Higher-level demand task	A cognitively demanding mathematics task that requires students to use procedures in ways that build conceptual understanding of important concepts	p. 28
Lower-level demand task	A task that typically requires less cognitive effort and involves recitation of number facts or using procedures and algorithms in isolation	p. 28
Mathematical task	"A single problem or a set of problems that focuses student attention on a mathematical idea" (Stein et al., 2000)	p. 18
"Naked math"	The idea in which students believe that doing math is simply calculating answers using symbols and procedures	p. 8
Rigor	The intellectual sense as having sufficient mathematical complexity, and as such, places meaningful cognitive demands on the learner; a way of attention to student culture and community; an embracing of complexity, both intellectual and relational	p. 12
Sociocultural prompt	Provides specific direction or requirement for the learner to address social, cultural, and/or political conditions in the context	p. 20

References

Aguirre, J., Mayfield-Ingram, K., & Martin, D. B. (2013). *The impact of identity in K–5 mathematics: Rethinking equity-based practices*. National Council of Teachers of Mathematics.

Barta, J., Eglash, R., & Barkley, C. A. (2014). *Math is a verb: Activities and lessons from cultures around the world*. National Council of Teachers of Mathematics.

Bender, A., & Beller, S. (2012). Nature and culture of finger counting: Diversity and representational effects of an embodied cognitive tool. *Cognition*, *124*(2), 156–182. https://doi.org/10.1016/j.cognition.2012.05.005

Burns, M., & Silveria, G. (1994). *The greedy triangle*. Scholastic.

Byers, G., & Bobo, K. (2018). *I am enough*. HarperCollins.

Campoy, F. I., Howell, T., Sananes, A., & Lopez, R. (2020). *Maybe something beautiful: How art transformed a neighborhood*. Findaway World.

Carle, E. (1969). *The very hungry caterpillar*. Putnam & Grosset.

DiSalvo-Ryan, D. (1994). *City green*. HarperCollins.

Dodds, D. A. (2005). *The great divide* (Reprint ed.). Candlewick.

Drummond, J., Bynum, B., & McGee, B. (2016). *I'm a brilliant little Black boy!* Paper Up.

Enyedy, N., & Mukhopadhyay, S. (2007). They don't show nothing I didn't know: Emergent tensions between culturally relevant pedagogy and mathematics pedagogy. *Journal of the Learning Sciences*, *16*(2), 139–174. https://doi.org/10.1080/10508400701193671

Fears, D. (2020, November 16). Shingle Mountain: How a pile of toxic pollution was dumped in a community of color. *The Washington Post*. https://www.washingtonpost.com/climate-environment/2020/11/16/environmental-racism-dallas-shingle-mountain/

Fleischman, P., & Pedersen, J. (1997). *Seedfolks* (1st ed.). HarperCollins.

Foote, M. Q., Roth McDuffie, A., Aguirre, J., Turner, E. E., Drake, C., & Bartell, T. G. (2015). Mathematics learning case study module. In C. Drake et al. (Eds.), *TeachMath learning modules for K–8 mathematics methods courses* (Teachers Empowered to Advance Change in Mathematics Project). http://www.teachmath.info

Gutstein, E., Lipman, P., Hernandez, P., & de los Reyes, R. (1997). Culturally relevant mathematics teaching in a Mexican American context. *Journal for Research in Mathematics Education*, *28*(6), 709–737. https://doi.org/10.2307/749639

Heiligman, D. (2013). *The boy who loved math: The improbable life of Paul Erdos*. Roaring Brook Press.

Jones, S. M. (2015). Mathematics teachers' use of the culturally relevant cognitively demanding task framework and rubric in the classroom. *NERA Conference Proceedings* 2015. https://opencommons.uconn.edu/nera-2015/12

Jones, S. M. (2018). Teachers' conceptions of teaching mathematics for social justice: Building on their knowledge of culturally relevant pedagogy. *New England Mathematics Journal*, LI(2), 50–63.

Joseph, G. G. (2011). The crest of the peacock: Non-European roots of mathematics (3rd ed.). Princeton University Press.

Krumer-Nevo, M., & Sidi, M. (2012). Writing against othering. *Qualitative Inquiry*, *18*(4), 299–309. https://doi.org/10.1177/1077800411433546

Ladson-Billings, G. (1994). *The dreamkeepers: Successful teachers of African-American children*. Jossey-Bass.

Ladson-Billings, G. (1995a). But that's just good teaching! The case for culturally relevant teaching. *Theory into Practice*, *34*(3), 159–165. https://doi.org/10.1080/00405849509543675

Ladson-Billings, G. (1995b). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal*, *32*(3), 465–491. https://doi.org/10.3102/00028312032003465

Ladson-Billings, G. (2014). Culturally relevant pedagogy 2.0: aka the remix. *Harvard Educational Review*, *84*(1), 74–135. https://doi.org/10.17763/haer.84.1.p2rj131485484751

Leonard, J., & Guha, S. (2002). Creating cultural relevance in teaching and learning mathematics. *Teaching Children Mathematics*, *9*(2), 114–118. https://doi.org/10.5951/TCM.9.2.0114

Matthews, L. E. (2003). Babies overboard! The complexities of incorporating culturally relevant teaching into mathematics instruction. *Educational Studies in Mathematics*, *53*, 61–82. https://doi.org/10.1023/A:1024601504028

Matthews, L. E. (2005). Towards design of clarifying equity messages in mathematics reform. *The High School Journal*, *88*(4), 46–58. https://doi.org/10.1353/hsj.2005.0009

Matthews, L. E. (2009). Identity crisis: The public stories of mathematics educators. *Journal of Urban Mathematics Education*, *2*(1), 1–4.

Matthews, L. E. (2018). 2008—Illuminating urban excellence: A movement of change within mathematics education [Special issue]. *Journal of Urban Mathematics Education*, *11*(1–2).

Matthews, L. E., Jones, S. M., & Parker, Y. A. (2013). Advancing a framework of culturally relevant, cognitively demanding mathematics tasks. In J. Leonard & D. B. Martin (Eds.), *The brilliance of Black children in mathematics: Beyond the numbers and toward a new discourse* (pp. 123–150). Information Age.

Mills, A., & Osborn, B. (2003). *Shapesville*. Gurze Books.

Milway, K. S., & Fernandes, E. (2008). *One hen: How one small loan made a big difference*. Kids Can Press.

National Council of Teachers of English. (2020, July 13). *Key aspects of critical literacy: An excerpt*. NCTE. https://ncte.org/blog/2019/07/critical-literacy/

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. National Council of Teachers of Mathematics.

National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010). *Common Core State Standards mathematical practice*. National Governors Association Center for Best Practices, Council of Chief State School Officers.

Park, F., Park, G., & Potter, K. (2005). *The have a good day cafe*. Lee & Low Books.

Reid, M., & Chamberlain, S. (1995). *The button box*. Puffin Books.

Shetterly, M. L. (2016). *Hidden figures: The untold story of the African-American women who helped win the space race*. William Collins.

Stein, M. K., Smith, M. S., Henningsen, M. A., & Silver, E. A. (2000). *Implementing standards-based mathematics instruction: A casebook for professional development*. Teachers College Press.

Tate, W. F. (2004). "Brown," political economy, and the scientific education of African Americans. *Review of Research in Education*, *28*(1), 147–184. https://doi.org/10.3102/0091732X028001147

Taylor, P. C. (1996). Mythmaking and mythbreaking in the mathematics classroom. *Educational Studies in Mathematics, 31*(1/2), 151–173. http://www.jstor.org/stable/3482938

Van de Walle, J. A. (2013). *Elementary and middle school mathematics: Teaching developmentally*. Pearson.

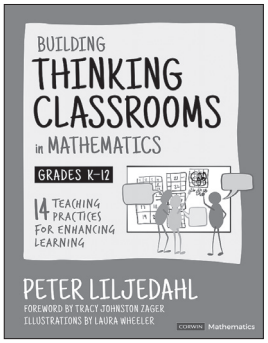
Wiggins, G. P., & McTighe, J. (2005). *Understanding by design* (2nd ed.). Pearson.

Zevenbergen, R. (1996). Constructivism as a liberal bourgeois discourse. *Educational Studies in Mathematics*, *31*, 95–113. https://doi.org/10.1007/BF00143928

Index

CORWIN Mathematics

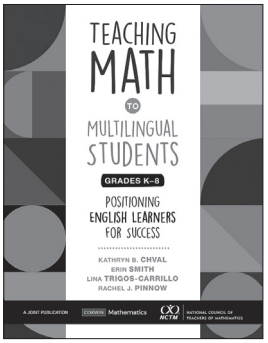
Supporting TEACHERS | Empowering STUDENTS



PETER LILJEDAHL

14 optimal practices for thinking that create an ideal setting for deep mathematics learning to occur

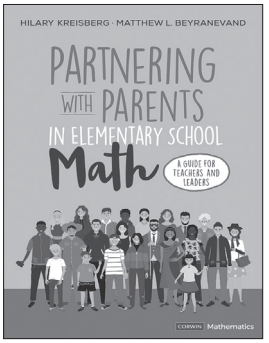
Grades K–12



KATHRYN B. CHVAL, ERIN SMITH, LINA TRIGOS-CARRILLO, RACHEL J. PINNOW

Strengths-based approaches to support multilingual students' development in mathematics

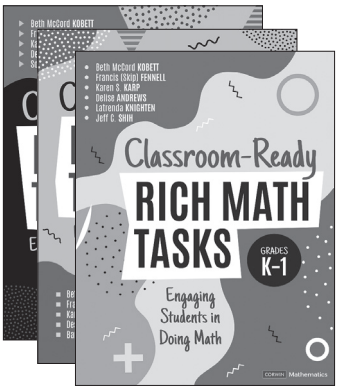
Grades K–8



HILARY KREISBERG, MATTHEW L. BEYRANEVAND

Guidance on building productive relationships with families about math education

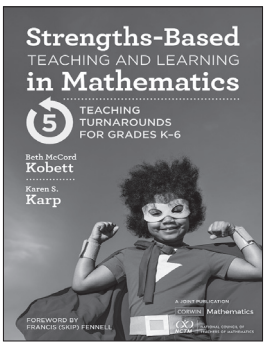
Grades K–5



BETH MCCORD KOBETT, FRANCIS (SKIP) FENNELL, KAREN S. KARP, DELISE ANDREWS, TRENDA KNIGHTEN, JEFF SHIH, DESIREE HARRISON, BARBARA ANN SWARTZ, SORSHA-MARIA T. MULROE

Detailed plans for helping elementary students experience deep mathematical learning

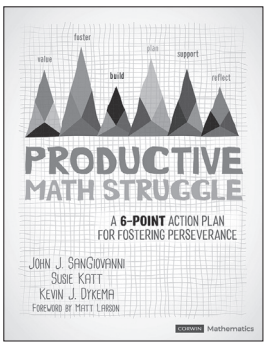
Grades K–1, 2–3, 4–5



BETH MCCORD KOBETT, KAREN S. KARP

Your game plan for unlocking mathematics by focusing on students' strengths

Grades K–6



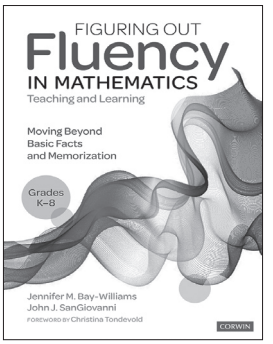
JOHN J. SANGIOVANNI, SUSIE KATT, KEVIN J. DYKEMA

Empowering students to embrace productive struggle to build essential skills for learning and living—both inside and outside the classroom

Grades K–12

To order, visit corwin.com/math

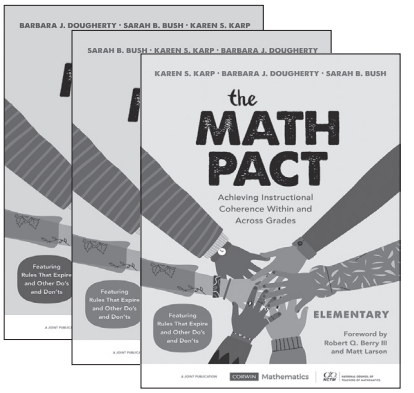
Whole Number Addition and Subtraction & Multiplication and Division With Whole Numbers coming August 2021!



JENNIFER M. BAY-WILLIAMS, JOHN J. SANGIOVANNI

Because fluency is so much more than basic facts and algorithms

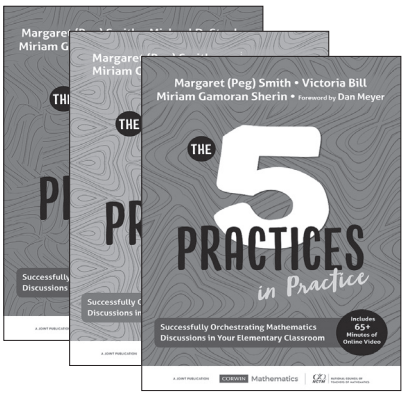
Grades K–8



KAREN S. KARP, BARBARA J. DOUGHERTY, SARAH B. BUSH

A schoolwide solution for students' mathematics success

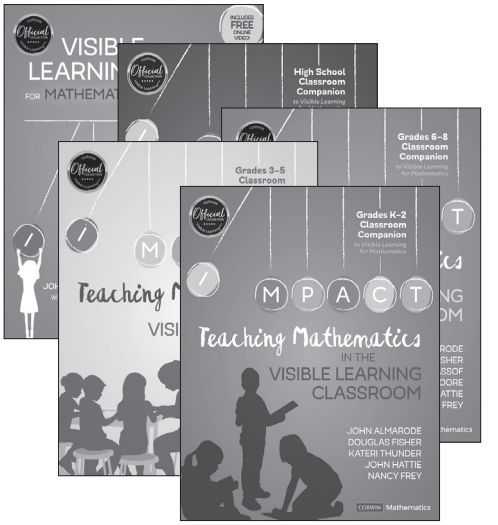
Elementary, Middle School, High School



MARGARET (PEG) SMITH, VICTORIA BILL, MIRIAM GAMORAN SHERIN, MICHAEL D. STEELE

Take a deeper dive into understanding the five practices—anticipating, monitoring, selecting, sequencing, and connecting—for facilitating productive mathematical conversations in your classrooms

Elementary, Middle School, High School



JOHN HATTIE, DOUGLAS FISHER, NANCY FREY, JOHN ALMARODE, LINDA M. GOJAK, SARA DELANO MOORE, WILLIAM MELLMAN, JOSEPH ASSOF, KATERI THUNDER

Powerful, precision teaching through intentionally designed, guided, collaborative, and independent learning

Grades K–2, 3–5, 6–8, 9–12

This page is intentionally left blank

Helping educators make the greatest impact

CORWIN HAS ONE MISSION: to enhance education through intentional professional learning.

We build long-term relationships with our authors, educators, clients, and associations who partner with us to develop and continuously improve the best evidence-based practices that establish and support lifelong learning.

This page is intentionally left blank