VOLUME 25 | ISSUE 1 | AUGUST 2024

NCSM JOURNAL

OF MATHEMATICS EDUCATION LEADERSHIP

VERTICAL LESSON STUDY TO BRING COHERENCE IN PRIORITIZING STUDENT CONTRIBUTION AND VOICE

ONE CURRICULUM COMMITTEE'S PERCEPTIONS OF HIGH-QUALITY MATERIALS

NCSM –Leadership in Mathematics Education | www.mathedleadership.org

Table of Contents

ONE CURRICULUM COMMITTEE'S PERCEPTIONS OF HIGH-QUALITY MATERIALS

Erica N. Mason
University of Illinois Urbana-Champaign
Camille Griffin
University of Illinois Urbana-Champaign
Ga Kyung Jeong
Columbia College

ABSTRACT

This paper highlights aspects of the curriculum adoption process that may have previously been overlooked—the degree to which the curriculum committee has a shared view with one another of material quality, including committee members' views about material appropriateness and the alternatives they would recommend for students. We highlight one curriculum committee's perspectives, which were generally coherent with one another with respect to their views of material quality and appropriateness. In addition to describing details of the project, we share key insights and make recommendations for how other districts might attend to these aspects of a curriculum series adoption that promote more inclusive mathematics experiences for all students.

Keywords: mathematics curriculum, interdisciplinary perspectives, high-quality materials, appropriate materials.

Many school districts undergo curricular reforms with the hopes of creating coherent mathematics learning opportunities for PreK-12 students (Hirsch & Reys, 2009). Although it is important for the curricular materials themselves to have coherence, or a logical sequence of topics (Confrey et al., 2017), it may be similarly important that the people selecting those materials achieve two kinds of coherence—a shared view of material quality within the group and that the group's views align with existing research about what constitutes high-quality curricular materials. Personnel coherence is necessary for sustained instructional improvement, requiring effort from people invested in mathematics education across a school district (Cobb et al., 2020). After uncovering the degree to which personnel coherence exists, a district could examine the degree to which the group's perspective aligns with professional guidance.

Achieving personnel coherence may be challenging because often, invested persons are brought together to form a multi-disciplinary committee, charged with finding, evaluating, and piloting materials. Committee members from various disciplines may hold divergent views about mathematics teaching (e.g., van Garderen et al., 2009), which if left unaddressed could disrupt the process of selecting a series that reflects the personnel coherence needed for instructional change. Conversely, working with a multi-disciplinary committee has affordances for those engaged in the work, some of which include innovative thinking (Hardré et al., 2013), programmatic improvement (Goos & Bennison, 2018), and opportunities for people to develop cross-disciplinary empathy (Mason & Thomas, 2021). This suggests that perceptions about material quality are not neutral and that disciplinary differences could either hinder or enhance the curriculum selection process.

It is further necessary to investigate these views since high-quality materials alone will not ensure robust opportunities for students to learn. The National Council of Teachers of Mathematics (NCTM; 2014) clarifies:

> *Administrators should recognize that pacing guides, textbooks, and other instructional materials can guide the planning process but should never take the place of the teacher in determining how to meet the needs of students in a particular class most effectively (p. 77).*

This excerpt highlights the teacher's role in making use of curricular materials by deciding that particular materials are or are not appropriate to meet their students' needs. Because curricular materials are strongly linked to students' opportunities to learn (Choppin et al., 2021; Choppin et al., 2022; Stein et al., 2007), it seems especially important to understand how practitioners might, through their role on a curriculum committee, make similar decisions when considering the students in their district.

We note here that existing literature about mathematics materials does not regularly include perspectives from curriculum committees, evidenced by the lack of empirical citations to which we can reference. What little discussion we did find about the experience of being on a curriculum committee was not empirical but was one person's editorial account of their experience (e.g., Newman, 2004). Despite this lack of attention, we contend that the decision curriculum committees are tasked to make—determi ning which materials are appropriate for the district to adopt—parallels the decisions classroom teachers make each day when using materials with students. That is,

curriculum committees shape what materials are available to and sanctioned by the district (Hirsch & Reys, 2009), thereby placing boundaries around teachers' choices about what to teach. Similarly, when a teacher selects something to teach from or outside of the district-provided curriculum, they are placing boundaries around what students have the opportunity to learn (Choppin et al., 2021; Choppin et al., 2022; Stein et al., 2007).

Unlike other investigations that describe teachers' attention to or use of particular features within a specific curricular series (e.g., Fuentes & Ma, 2018; McDuffie et al., 2018) or teachers' perceptions and use of materials (e.g., Remillard & Bryans, 2004), we were working with a district that did not yet have specific materials to analyze. Because our partners were in the process of choosing materials, we were interested in eliciting views that could indicate the features to which this multi-disciplinary committee might be drawn, specifically noticing the degree to which those views were congruent with one another. We recognize that beliefs about what counts as appropriate and high-quality likely vary amongst teachers and could, under different circumstances, be conceptualized differently. Thus, we are careful not to suggest there is universal agreement about these constructs. This article describes one district's curriculum committee and their views of high-quality mathematics materials, including their perceptions about the appropriateness of particular material features for a range of students. Before describing the data, we first reiterate the link between curricular materials and opportunities to learn, unpack what professional organizations identify as features of high-quality materials, and highlight groups of students for whom access to high-quality materials has been sporadically or scarcely afforded. We then share the findings from our study and conclude with a set of implications for curriculum committees and district leaders who may be embarking on a district-wide series adoption.

HOW ARE CURRICULAR MATERIALS RELATED TO MATHEMATICS LEARNING?

As Hiebert et al. (2007) suggested, the curriculum plays a part in shaping the learning opportunities afforded to students. Curriculum use can be considered in three phases: the written curriculum, the intended curriculum (i.e., what teachers plan to do), and the enacted curriculum (i.e., what teachers *actually* do; Stein et al., 2007). The written curriculum, the focus of this study, consists of mathematical tasks that vary in terms of rigor. Mathematical tasks can be considered to have lower- or higher-levels of cognitive demand with lower-level tasks characterized as *memorization* or *procedures without connections* (Smith & Stein, 1998). Mathematical tasks at these levels are disconnected from concepts, unambiguous, and aimed at producing correct answers, absent of conceptual understanding. Higher-level tasks are characterized as *procedures with connections* and *doing mathematics* (Smith & Stein, 1998). Mathematical tasks at these levels are conceptually oriented, ambiguous, and require non-routine thinking. Thus, such tasks can be represented and solved in multiple ways. The nature of mathematical tasks is, therefore, inextricably linked to the types of learning opportunities possible within the task (Stein et al., 2007). Professional organizations have thus articulated the kinds of learning opportunities they associate with high-quality materials.

EXISTING GUIDANCE FOR EVALUATING THE QUALITY OF CURRICULAR MATERIALS

The NCTM and the Association of Mathematics Teacher Educators (AMTE) offer consistent guidance about the features of curricular materials that especially warrant the attention of prospective and in-service teachers. The message from both organizations is clear: the materials do not shape the curriculum, rather the materials are a tool for teachers; high-quality materials should align with the goals of and support student learning. One recommendation from multiple professional organizations is that teachers should use materials that facilitate coherent learning experiences for students within and across grade levels (AMTE, 2017; NCTM, 2014). Specifically, the NCTM (2014) indicates that materials should reflect everyday life and promote mathematical problem solving and reasoning. Further, the AMTE (2017) specifies that materials should include tasks that are meaningful, specifically that contexts and examples are related to what students would consider their real world (and not just what teachers may perceive as students' real world).

In addition to these specific features, both organizations foreground the role of the teacher in interacting with the materials and ultimately making instructional decisions. The AMTE (2017) promotes the idea that beginning mathematics teachers are prepared to adeptly read, interpret, and enact lessons. Specifically:

> *They have the content preparation and the dispositions to analyze instructional resources, including those provided by textbook publishers and those available from sources online, to determine whether these resources fully address the content expectations described in standards and curriculum documents (p. 10).*

This indicates that in addition to the skills needed to analyze a variety of curricular materials, teachers also need a particular disposition or attitude to make such instructional decisions. This professional disposition likely entails, in part, using an equity lens when evaluating and using curricular materials. With respect to materials, the NCTM's Equity Principle advocates that equity is achieved when teachers tailor their supports to facilitate mathematical success for students. This suggests that we would expect practitioners to view different materials as more or less appropriate for various learners. If something is deemed less appropriate for some learners, the question then becomes, what next? Or what instead? That is, if a curricular feature was determined inappropriate for some students, what would the practitioner turn to instead, and what impact would such a pivot have on the learning opportunity afforded to those students? Relatedly, the AMTE's (2017) indicator, Understand Power and Privilege in the History of Mathematics Education, also calls for well-prepared beginning mathematics teachers to

ask questions about the type of instructional materials to which students have access. Given that both organizations indicate the need for practitioners to develop equity-oriented dispositions to evaluate the quality of instructional materials, it seems important to investigate whether and to what degree a district's curriculum committee—those uniquely positioned to make a crucial decision—may reflect this stance.

(IN)EQUITABLE ACCESS TO HIGH-QUALITY CURRICULAR MATERIALS

Despite the importance of the written curriculum in affording learning opportunities, researchers agree that some students have disproportionate opportunities to access high-quality materials, which likely relates to their disproportionate opportunities to learn. It is well documented that students who face persistent marginalization are excluded from opportunities to engage in high-quality mathematics learning opportunities, specifically students of color (e.g., Battey, 2013; Berry et al., 2014), multilingual students (e.g., Callahan, 2018), and students with disabilities (e.g., Lewis & Fisher, 2016). One factor persistently linked to the learning opportunities afforded to students is teachers' views about who they perceive to be mathematically capable. That is, general education mathematics teachers have reported making instructional adjustments that vary in quality (e.g., Jackson et al., 2017), specifically in relation to students' disability status (e.g., Mason, 2023). Teachers' views have also been related to diminished learning opportunities for racially and linguistically diverse students (e.g., Wilhelm et al., 2017). Given the relation between teachers' views of students' mathematical capabilities and students' opportunities to learn, it would seem important to investigate whether such views were also related to the process of adopting a new curricular series. Beyond individual editorials about their experiences on a curriculum committee (e.g., Newman, 2004), this idea has been minimally explored. Yet, if teachers' views have been linked to differing articulated and enacted learning opportunities, those same views could reasonably surface amongst curriculum committee members. More pointedly, other curriculum researchers (e.g., Choppin et al., 2022) have identified the need to consider the context and demographics of the research site as important factors for understanding curriculum selection and use.

The purpose of the current study was to understand how the members of one district's curriculum committee thought about curricular materials in terms of their quality and their appropriateness for different groups of students. The following research questions guided our investigation:

1. How do curriculum committee members characterize high-quality materials?
2. How do curriculum committee members talk about material appropriateness with respect to different groups of students?
3. To what degree do curriculum committee members have a coherent view with one another of high-quality materials?

BACKGROUND AND CONTEXT

Unity School District (a pseudonym) is in a small city in the Midwestern U.S. The largest percentage of students in this district identify as White (46%), followed by Hispanic (27%), and Black (17%), with the majority of students identified as low-income (69%). The district also serves students identified as English Learners (18%) and students with disabilities (18%).

Motivated by several persistent issues discussed here, Unity was in the process of adopting a new mathematics curricular series. After evaluating the district's standardized test data, district leaders found that a low number of students were meeting benchmark proficiency levels in math. As a result of this and other factors, they determined that the core math curriculum did not adequately support student math performance across the district. Other factors included high rates of students who were failing Algebra 1 by the time they got to high school. These poor outcomes were attributed to an incoherent mathematics learning experience across grade bands. Until this adoption, each grade band used their own curricular series. In response to these concerns, the district formed an ad hoc committee whose purpose was to select the new series that would be used PreK–12. To ensure the committee was representative of the district, one of the district's Assistant Superintendents and the Curriculum Director elicited interest in joining the committee from early childhood teachers, elementary teachers, building-level leadership, and district leadership, selecting committee members who represented a variety of buildings and grade bands. The district's one high school and one middle school mathematics department chairs were included on the committee, as well as representation from middle grades and secondary special education. This committee had not worked together previously and included individuals from a range of district roles and grade bands (see Table 1). They were tasked with choosing a curricular series that would support students PreK–12 and be used consistently across teachers and buildings.

Given the district's disjointed curricular history in mathematics, district leaders emphasized the importance of fidelity to whatever series was adopted. District leaders recognized the importance of teachers' agency in the instructional process, but because previous efforts were so uncoordinated leaders prioritized fidelity at the onset of adoption, highlighting the need for a district-wide structure. At the time of this project, the Curriculum Director expressed an interest in understanding how curriculum committee members perceived the experience of being on the committee, so in addition to the research questions addressed, we also collected data about participants' experiences on the committee. That information was not considered data and is therefore not shared here. The authors played no role in the district's series adoption process.

Recruitment and Participants

The Unity school district's Mathematics Curriculum Committee met regularly throughout the 2021–2022 school year, though the authors did not observe nor collect data

during any of those meetings. In the fall of 2021, the first and second authors attended a single meeting to introduce the project to the committee members. During the meeting, we provided information about the level of participation, compensation, and safety measures in place to protect the participants' identities. After the meeting, all committee members (N = 25) received an email with a link to a consent form; 13 participants (52%) consented to participate. Participants included five district-level administrators (39%), five building-level administrators (39%), and three classroom teachers (23%). The majority of participants identified as women (n = 11; 85%); the majority of participants identified as White (n = 11; 85%). Table 1 contains a list of participant information.

The participants in this study held a range of professional roles in their district. The Curriculum Director oversaw all curricular efforts, PreK–12. This person also supervised the two Curriculum Coordinators, whose work was focused in either elementary or secondary schools throughout the district. The district had one Grants Coordinator who, because of their prior experience with mathematics curriculum and instruction in another school district, was included on this committee. The Grants Coordinator was responsible for applying for and carrying out work in the district that was funded by external grants (e.g., afterschool programming). The Dual Language Coordinator supported the district's robust dual language program, which at the time of this study, was prevalent at the elementary (Grades K–5) and middle school (Grades 6–8) levels. The Building Principal oversaw the day-to-day operations of one elementary school in the district. Every school was assigned a Mathematics Instructional Coach (and an English Language Arts Instructional Coach counterpart) and supported mathematics instruction, including curriculum enactment, at their respective buildings. This committee also included general and special education teachers who were responsible for delivering mathematics instruction to students.

Table 1
Participant Information

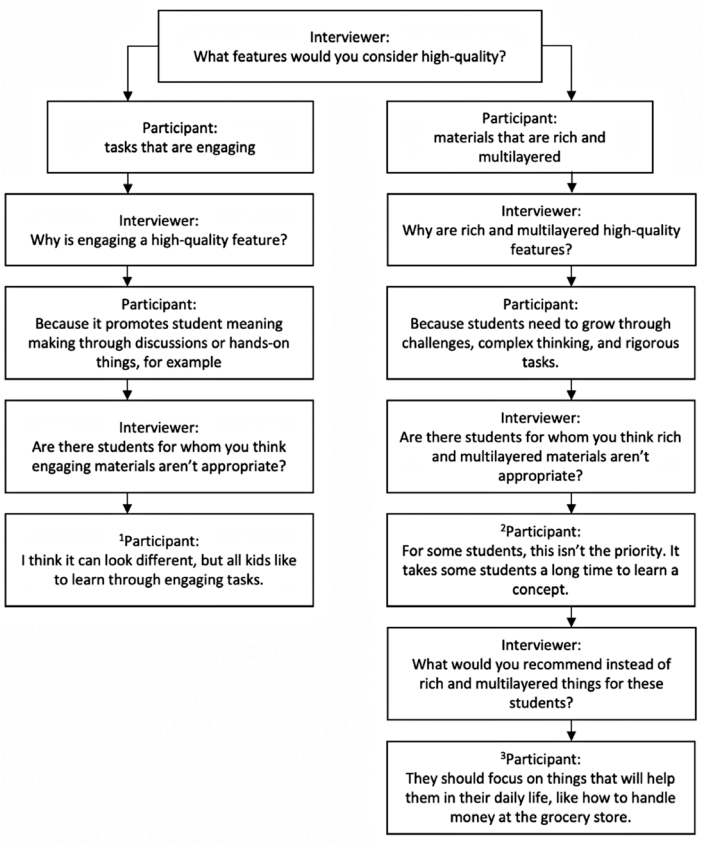
Participant Name	Participant Role	Grade Level/Area
Alex	Curriculum Director	District
Amanda	Curriculum Coordinator	Secondary
Erin	Curriculum Coordinator	Elementary
Jocelyn	Grants Coordinator	District
Lucia	Dual Language Coordinator	Early Childhood
Beatriz	Building Principal	Elementary School
Margaret	Mathematics Instructional Coach	Middle School
Sam	Mathematics Instructional Coach	Elementary School
Tina	Mathematics Instructional Coach	Elementary School
Marie	Mathematics Instructional Coach	Elementary School
Joe	General Education Teacher	High School
Elizabeth	Special Education Teacher	Middle School
Tiffany	General Education Teacher	Elementary School

Note. Participants' names are pseudonyms.

Data Collection

During the 2021–2022 school year, we conducted two one-on-one interviews with each participant, for a total of 26 interviews in the whole data corpus. This paper shares findings from a subset of that corpus, 13 interviews conducted in fall 2021, which were, on average 39 minutes long (ranging from 22:28–55:45 minutes). We focused this analysis on the fall 2021 interview responses because the second interview protocol addressed content that falls outside the scope of these research questions and analysis. Participants had the choice to complete the interview in person or via Zoom. The first author conducted all the interviews using a semi-structured interview protocol which consisted of nine questions: (a) two questions about participants' views of high-quality mathematics materials, (b) one question about their views of material appropriateness and recommended alternatives, and (c) six questions about their experiences on the committee; Figure 1 provides an example of how the interview flowed between parts (a) and (b). Questions in part (c) were synthesized and shared with the Curriculum Director, participating members of the curriculum committee, and the Assistant Superintendent for Curriculum and Instruction. All interviews were audio recorded and transcribed.

Figure 1
Example Interview Flow



Note. See Analysis section for an explanation of the superscripts.

A member of the research team created a one-page summary of the interview and emailed the summary to participants as a member check. The majority of participants responded to those emails (n = 11; 85%) and either confirmed that the summary reflected their views or provided minor edits. If participants provided edits about the content of the interview, the participant-edited summary was attached to the end of the transcript; if participants provided edits about diction, syntax, or other aspects of structure, the original transcript was retained.

Analysis

To answer the first research question (How do curriculum committee members characterize high-quality materials?), we used Saxe et al.'s (1999) form-function distinction to foreground the rationales participants gave (function) with respect to curricular features they considered high-quality (form). Because we thought the term *form* would be confusing for participants, we used the term *feature* when asking participants to talk about the components of materials they considered high-quality. However, during analyses, we understood that the features named were the forms. We emphasized participants' rationales (i.e., the functions they articulated) because, in conversation with Unity's Curriculum Director, she expressed concern committee members might get stuck on whether a series included a particular feature and overlook the possible outcome of that feature. Prioritizing the outcome of a feature over the feature itself mirrors professional guidance around material quality (AMTE, 2017; NCTM, 2014). So instead of looking for particular features, the Director was more interested in choosing a series that created certain kinds of learning experiences for students. To our knowledge, this message was not necessarily made explicit to curriculum committee members. Given this focus, we asked participants to name the curricular features they would consider high-quality and articulate *why* they would consider that feature an indicator of quality. We assigned concept codes (Saldaña, 2021) to segments of each transcript where a participant stated a function. Our concept codes came from participants' words. For example, Curriculum Coordinator, Erin stated that authors of curricular materials should "actually have taken the time to think about who materials are written for, maybe not their own experience, but a broader scope because we don't just teach one kind of student." Hence, this excerpt was labeled with the function code "reflect a broader scope." We then collapsed like concept codes into broader thematic codes, which included a range of forms, but all articulated as having a common function. For example, the function codes "reflect a broader scope," "support a range of students," "reach a wide population," and "reach more students" were collapsed into the thematic code, *reach a range of students.* Finally, thematic codes were collapsed into over-arching themes intended to characterize similar responses (see Table 2 for all thematic codes and overarching themes; see Appendix A for a complete list of forms).

To address the second research question (How do curriculum committee members talk about material appropriateness with respect to different groups of students?), we examined participants' talk about for whom particular curricular features were viewed as more or less appropriate. This part of the interview protocol followed a series of questions that, depending on the participant's response, elicited specific follow-up questions; Figure 1 illustrates the possible flow of the interview depending on a participant's response. After asking about their rationale for why the features they named were considered high-quality, we asked participants to talk through each feature they named with respect to the appropriateness of that feature for different groups of students and the alternatives to that feature they might employ. We asked participants if there were groups of students for whom they thought a particular feature was or was not considered appropriate. If the participant said the feature was appropriate for all students, we assigned the descriptive code *everyone* and proceeded with the interview (see Figure 1, superscript 1). If, however, the participant said a particular feature was not appropriate for all students, we generated a descriptive code that characterized the response (e.g., *long time to learn*; see Figure 1, superscript 2). This then prompted us to ask participants to suggest what they would recommend instead of the feature being discussed. Based on participants' responses we assigned another descriptive code (e.g., *decrease rigor*; see Figure 1, superscript 3). Then, we collapsed like codes to generate broader thematic codes (see Table 2 for all thematic codes and overarching themes).

Finally, to answer the third research question (To what degree do curriculum committee members have a coherent view with one another of high-quality materials?), we looked across the dataset and evaluated whether committee members' responses were coherent. Responses were considered coherent if participants (a) identified curricular features that served similar functions, (b) expressed similar views about the appropriateness of particular curricular features for different groups of students, and (c) suggested alternatives that served similar purposes.

FINDINGS

Participants in this project largely characterized high-quality mathematics materials within three themes. They articulated a variety of rationales for the appropriateness of material features for certain students and alternative options. Our results suggest that curriculum committee members generally identified similar high-quality material features and considered those features appropriate for a range of students, thus reflecting a high degree of coherence across this committee.

How do Curriculum Committee Members Characterize High-Quality Materials?

We asked participants what features (i.e., forms) of mathematics materials they would consider high-quality and, using Saxe et al.'s (1999) form-function distinction, our analysis revealed that curriculum committee members named 60 unique curricular features (i.e., forms) they considered to be high-quality and articulated a range of rationales (i.e., functions) for why those features were considered high-quality (see Appendix A for our codebook). Eleven of these rationales were excluded from

our final analysis because they were articulated in terms of supporting teachers, for example, materials that included a comprehensive teacher's guide. Although a teacher could use a teacher's guide to improve instruction for students and could articulate how a teacher's guide would facilitate this, if the participant framed the feature only in terms of supporting adults instead of students, we excluded it from our analysis. Across the articulated rationales, we identified three themes: *to reflect and reach a range of students; to foster a sensical and meaningful learning experience;* and *to yield multiple learning outcomes, especially student thinking and understanding*. The results of our first research question are listed in Table 2.

Table 2
Themes and Thematic Codes Across Articulated Rationales

To reflect and reach a range of students	To foster a sensical and meaningful learning experience	To yield multiple learning outcomes, especially student thinking and understanding
• reflect a range of students (4) • reach a range of students (4) • meet students' needs (3)	• increase content continuity and comprehension (6) • accurately assess student knowledge (6) • increase engagement and motivation (6) • promote independence and choice (5)	• attend to student understanding, reasoning, and meaning making (11) • promote learning and thinking (9) • considering the future or "real world" (3) • promote procedural knowledge toward solving (3)

Note. Numbers in parentheses represent the number of features (i.e., forms) participants named to meet that function. For example, participants named six features that were related to the rationale (i.e., function) "increase content continuity and comprehension."

To Reflect and Reach a Range of Students

Participants expressed the importance of using materials that reflected the students in their school district, specifically students seeing themselves in the materials and seeing mathematics as important to their lives. Erin, the Elementary Curriculum Coordinator, said, "I look at a lot of curriculums and there's not humanity in it […] [They] are designing for a broad mass of one level of people and [they're] not taking into consideration the people that [we're] teaching." Relatedly, she emphasized that a curriculum that reflected her students would also reflect how students learned best, saying:

> *If my student is somebody who makes more meaning out of concrete and kinesthetic [activities] then that's the method I'm going to teach them, so maybe Touch Math, or…some kids are more musically inclined and they remember their math facts because they can sing a song. You know, it just depends on what works for kids.*

A few participants gave rationales that framed *reaching a range of students* as meeting students' "needs," but more often, participants talked about the importance of material features that allowed the greatest number of students to be reached. Tiffany, an elementary general education teacher, described valuing materials that included opportunities for peer collaboration and said:

> *I think students learn by doing, not necessarily listening to what the teacher says…I think students grow more when they work together. They feed off of each other. So if another student is able to explain it. I think you hit more kids that way.*

To Foster a Sensical and Meaningful Learning Experience

Participants named features that were intended to make learning sensical and meaningful. Some participants talked about the role curricular materials and their features can play in allowing the content to have continuity across contexts. Tina, an elementary instructional coach, described a feature of high-quality materials as their alignment with the Common Core's Eight Mathematical Practices and said, "If you have that continuity and you have that common language, and you have that common focus, [everything is] still all connected. And there's that continuity for students."

Meaningful learning experiences were characterized in terms of student engagement and motivation, student independence and choice, and features that allowed for accurate assessment. Several participants named rationales that talked about the importance of students having buy-in in the learning process. Tina, an elementary instructional coach, promoted materials that embedded multiple curricular areas (e.g., mathematics and science), stating that in addition to increasing learning opportunities for students, engaging with multi-content materials creates "a context and a reason for learning it." Independence and choice were also important aspects of how participants talked about creating meaningful learning experiences for students. Marie, another elementary instructional coach, said:

> *We need to have something else that I can use in place of [tape diagrams[1]], or some student choice…so that if you like tape diagrams you can represent it that way. And if I like number lines, I can use a number line instead.*

Similarly, other participants gave rationales that emphasized the importance of student power and agency, specifically opportunities for students to learn independent of the teacher. For example, Sam, an elementary instructional coach, said:

> *Inquiry is such a powerful space for student ownership…'I have some control and I have some power in this space and I have some agency in the space and what I wonder [and] the way I see the world is valued in this space'...*

Finally, participants described meaningful experiences as also being about assessment opportunities. Marie, an elementary instructional coach, emphasized that materials that were flexible and adaptable served the purpose of

1 A tape diagram, or strip diagram, is a rectangular visual model resembling a segment of tape and is used to illustrate the number of parts in a whole and support understanding of number relationships and proportionality (Beckman, 2004).

allowing teachers to elicit students' background knowledge, which then allowed students to show their learning beyond standardized tools. Another participant, Elizabeth, a special education teacher, described the importance of informal opportunities to assess learning when introducing a new topic. She said, "I also think it's just interesting to kinda like take away the borders of math and to see what students do and how they figure out things." Elizabeth compared this more exploratory approach with more traditional approaches to teaching mathematics to students with disabilities where the teacher likely directs the learning. To her, it was meaningful to center student thinking by seeing how they informally "figure out things" instead of simply responding to a teacher's prompt or model.

To Yield Multiple Learning Outcomes, Especially Student Thinking and Understanding

Participants named features aimed at students' learning outcomes with a range of rationales. A few participants named focusing on procedural knowledge, with the goal of solving and considering students' future or the "real world" as evidence of material quality. However, the majority of features within this theme were focused on features that would promote and center students' thinking and understanding. Elizabeth, a special education teacher, articulated that an exploratory approach to mathematics "just really allows the students to create and think." She juxtaposed this to a more traditional teacher-guided model of instruction for students with disabilities. Beatriz, an elementary school principal, highlighted the importance of giving students the opportunity to become problem solvers: "We're teaching kids to be thinkers, we're teaching kids to be problem solvers. And when a child can't explain their thinking, then we're not growing them and their problem-solving skills."

Many participants articulated rationales that extended these ideas by talking about the importance of students making conceptual connections between mathematical ideas. Others talked about the effects of broadening their perspective about who was capable of engaging in rigorous mathematical activity and how that allowed them to see a feature as being beneficial for different students across time. One notable idea about this theme was the emphasis on student activity with respect to learning outcomes. For example, Erin, an Elementary Curriculum Coordinator, gave an example from a curricular series she had used in the past, explaining that a major component of the series was a teacher script, which resulted in students doing:

> *[A] lot of sitting and listening. That's not very engaging. It makes it very difficult for students to make meaning out of it…It's not engaging their brain in a meaningful way, and they aren't having to own it.*

Here, Erin contrasts something she observed in the past with the importance of attending to the nature of student activity to promote students' mathematical thinking and understanding.

How do Curriculum Committee Members Talk About Material Appropriateness with Respect to Different Groups of Students?

Participants in this sample generally viewed material features as appropriate for all students. In instances where participants questioned the appropriateness of a feature for particular groups of students, their rationales for feature alternatives were generally aimed at supporting students by increasing access or allowing for different approaches to the same content, activity, or task as other peers (see Figure 1 for an example of the questioning flow). We should note that some participants responded in such a way that asking the follow-up question about appropriateness would have prompted potentially problematic responses. For example, Amanda, the Secondary Curriculum Coordinator, said she would look for materials that employed a "cultural lens" so that students could "see themselves" in the materials. To follow-up this response by asking, "Do you think there are students for whom 'seeing themselves' is not appropriate?" would have reflected an over-adherence to the interview protocol and would not have generated useful information to address the questions posed in this project. Of all the curricular features named in this study ($N = 60$), we coded 24 (40%) instances where participants named a feature about which the interviewer determined it was inappropriate to ask the follow-up questions from our semi-structured protocol.

When participants questioned whether a feature would be appropriate for particular groups of students, their reasons for this belief were coded as *stating a fact*, *expressing authentic care*, or *external*. For the first category, many participants explained that a curricular feature may not be appropriate for a group of students and offered a reason that simply stated a fact about a student or group. For example, Elizabeth, a special educator, said that real world problems were an important feature, in part because those types of problems help students see the importance of mathematics. When asked about the appropriateness of real world problems for students, she named students with Autism as a group who may struggle with these types of problems if students interpret the problem literally, stating, "Due to […] the disability and […] things that were difficult, I had a hard time making some of those connections sometimes. [The student is] like, 'Well, I don't like, I'm never going to run a race.'"

We coded *expressing authentic care* when participants gave a reason that was framed as concerned with students' growth (Noddings, 1995) and not conveyed with judgment. Such concern might appear as a statement of fact or an honest description of a circumstance, but without language that assigned value. For example, Marie, an elementary instructional coach, described how some students might feel overstimulated by highly engaging activities, explaining:

> *Sometimes, there are students who are overstimulated by too much. And it might just be that there's too many materials to choose from…If that seems to be the engagement of this curriculum is too much [for] them, we look at that skill and concept and how I can still convey that to you in a way that isn't too much for you and build your capacity to be able to accept what I'm offering over here at some point in time.*

They expressed care for students by saying that being overstimulated may cause the student anxiety and, therefore, highly engaging activities may not be appropriate. Others may have characterized the situation by describing the student as anxious and thus judging the student for struggling to regulate their emotions. Finally, there were many instances (n = 8) in which participants named factors external to students as the reason some features may not be appropriate. For example, elementary instructional coach Marie recognized that materials that are flexible and adaptable may not be appropriate for multilingual learners. She says, "We've had some materials that are not serving our [English Learners], our dual language students […] they could just be better written as far as the directions or the number of steps or the amount that's on the page." We coded the accessibility of materials in students' home languages as a reason external to the student.

With respect to alternatives to the features named, most participants suggested making adjustments that maintained the rigor of the activity or otherwise gave access to the same activity that others in the class would also be doing (n = 23). Joe, a high school general education teacher, named "the opportunity to participate in group work" as a feature of high-quality mathematics materials. From Joe's perspective, opportunities for group work de-centered the teacher, which distributed mathematical authority, and allowed students to construct arguments and critique the reasoning of others. Joe explained this saying:

> *I do not want the students to see me as the only source of knowledge…I really want the students to get a flavor of the fact that they can learn from each other,…constructing arguments and critiquing the reasoning of others…It's not a thing that I have to teach; it happens naturally when they have that opportunity to talk to each other.*

When asked if there were students for whom group work was not appropriate, Joe said students with "math anxiety" might feel especially uncomfortable working in a small group. When asked about alternatives to group work, he said he would assign partner work instead, clarifying "there's a lot of think-pair-share types of situations also that happen, which does decrease the anxiety level of certain students." Here, the student who could be feeling anxious would still get to work with a peer, and arguably derive the same benefits but in a context that was aimed at decreasing the student's anxiety.

We coded very few features (n = 3, 4%) as inappropriate for students based on participants' rationales. In all instances, our codes reflected the participants' deficit framing in response to why a particular feature would not be appropriate for some students. Both Erin, the Elementary Curriculum Coordinator, and Tina, an elementary instructional coach, described particular features that may not be a priority for some students. When describing materials that included rich and multilayered tasks, Erin described these features as inappropriate for students who would, according to her, benefit from a greater focus on functional life skills (e.g., banking, grocery shopping). She says:

> *I'm just thinking about some students that I've had that have a hard time retaining information, retaining processes, so that kind of thinking [related to complex or multi-layered materials] might not be the priority. Maybe the priority is just making sure you're successful with some of the things that you're gonna run into in your daily life, like how to do your banking, how to add at the grocery store, how to handle money. That sort of thing.*

Tina had the same rationale, but for materials that included higher-order thinking problems. Erin also described opportunities for practice as inappropriate for some students because they had emotional challenges and that, no matter how many times a student practiced a skill, it was not going to stick.

To What Degree Did the Curriculum Committee Have a Coherent View with One Another of High-Quality Materials?

Despite their different disciplinary perspectives, we were able to categorize all of the curricular features participants named into three over-arching themes, suggesting this curriculum committee had a coherent view with one another of what features they considered high-quality. Beyond the coherency of their views about what constitutes material quality, they were also consistent in how they described for whom particular features would be appropriate and the nature of suggested alternatives. Although generally coherent, we also noticed there was not perfect agreement across committee members with respect to either the features they considered high-quality or for whom they considered particular features appropriate. This raises questions around the degree of coherence desired during a curriculum adoption and which we unpack further in the Discussion.

LIMITATIONS

Several limitations should be considered when interpreting the findings of this study. First, the study was conducted with one school district located in a small city. Findings of this study might reflect experiences and perspectives that are unique to the district and may not be representative of curriculum identification and adoption processes or perspectives at larger districts. Second, the results represent participants' perceptions about the process, with no evidence of how these perceptions may or may not have manifested in committee meetings and the actual decision of which series to adopt. This is not necessarily a limitation, per se, but warrants consideration from readers. Finally, participants reported inconsistent participation in committee meetings due to schedule complexity and other responsibilities related to their roles. This perhaps reflects the reality of many district-wide committees but should also be considered.

DISCUSSION AND RECOMMENDATIONS

This study aimed to illustrate how one district's curriculum adoption committee characterized high-quality curricular materials, broadly, and also with respect to a range of learners. Aligned with the three research questions guiding this study, we reported three main findings. Based on these

findings, we offer key insights and recommendations that others can consider when navigating a similar process. We also suggest existing resources and activities with which committees may engage (see Table 3 for a summary of recommendations).

Table 3

Key Insights, Recommendations, and Resources for Curriculum Adoption

Key insights	Recommendation
Viewing curricular features as appropriate for a wide-range of students can support a diverse range of students, including students who have been historically underserved in mathematics.	Engage in self-reflection and conversation to interrogate perceptions about student capability.[1, 3, 6, 8]
Identifying alternatives that maintain rigor and increase access may be important for ensuring all students get to engage with high-quality materials.	Learn about how the principles of Universal Design for Learning can be applied in mathematics and other approaches to making materials accessible.[2, 4, 7]
Individuals from different disciplines can have a coherent view of what constitutes high-quality materials.	Multi-disciplinary teams should invest time in understanding individual committee members' perspectives, foster dialogue, share resources, and broker differences between disciplines before the decision-making process begins.[5]

Resources

[1]DeMatthews (2020)
[2]Lambert (2021)
[3]Lewis (2016, Feb 5)
[4]Lynch et al. (2018)
[5]Mason & Thomas (2021)
[6]Matthews et al. (2022)
[7]Yeh et al. (2020)
[8]Zhao & Lapuk (2019)

Viewing Curricular Features as Appropriate for a Wide Range of Students Can Support a Diverse Range of Students

Our second research finding revealed that this curriculum committee generally identified materials as being appropriate for all students in their district. Because of the racial, ethnic, and cultural diversity in this district, this finding reflects the equity lens promoted by leading mathematics professional organizations (AMTE, 2017; NCTM, 2014) which advocates for centering and supporting a diverse student population, including students of color, multilingual students, and students with disabilities. Because students from marginalized identities often face persistent stereotyping and diminished opportunities to learn (e.g., Battey, 2013; Berry et al., 2014; Callahan, 2018; Lewis & Fisher, 2016), we would encourage committees to avoid the assumption that selecting and utilizing curricular materials is a neutral activity and instead recognize and interrogate committee members' perceptions about who is capable of engaging in particular kinds of mathematical activity.

We echo DeMatthews' (2020) recommendations to school leaders about attending to issues of racism and ableism that, if unaddressed, could contribute to viewing some students as not mathematically capable. A curriculum committee might explicitly reject notions of normalcy (e.g., discuss the ways in which some social identities–being White, not having a disability, being an English speaker–are considered "normal"), emphasize multidimensional identities (e.g., problematize labels and the disaggregation of data by labels that reinforce singular identities), invite an interdisciplinary lens (e.g., create district family-community input structures), and engage in activism and resistance (e.g., tap into local affiliates working to address injustice). For example, a curriculum committee might watch the video "Difference Not Deficit" (Lewis, 2016, Feb 5) in which Dr. Katie Lewis rejects the idea of normalcy surrounding how people "should," for example, solve and make sense of the problem 8 x 3. A committee might also look for supplemental resources, like Matthews et al.'s (2022) book about culturally relevant math tasks. Committees might use these and other resources to generate honest conversation about the assumptions and biases that shape how we think about which materials are and are not appropriate for particular students and generate actionable recommendations for how to meaningfully adapt curricular materials. When looking for information about teaching mathematics to students from historically marginalized groups, avoid resources that suggest some student groups need particular kinds of instructional approaches and therefore particular types of curricular materials (e.g., Codding et al., 2022). Instead, we encourage practitioners to seek out resources that present a nuanced view of an instructional practice or approach so that they can understand the benefits and drawbacks and make decisions accordingly (e.g., Lynch et al., 2018; Zhao & Lapuk, 2019).

Identifying Alternatives That Maintain Rigor and Increase Access May be Important for Ensuring All Students Get to Engage with High-Quality Materials

Another aspect of our second research finding was the importance of maintaining the rigor of mathematical activity and ensuring access for students when working with materials that were not, in the original form, considered appropriate for students. Because curricular materials are related to the kinds of learning opportunities afforded to students (Choppin et al., 2021; Choppin et al., 2022; Stein et al., 2007), it is essential that the work of a curriculum committee is not taken lightly, including how those committee members conceptualize curricular alternatives. As curriculum committee members and others consider alternatives to curricular features or material resources, we emphasize the idea that material alternatives or efforts to individualize materials do not necessitate removing students from the whole-group context nor providing them with materials that significantly diverge from the whole-group lesson. Instead, alternatives can consider ways to increase accessibility and also maintain rigor. There are multiple frameworks available that promote increasing accessibility. Universal Design for Learning (UDL; CAST, 2018) is one framework that suggests implementing proactive and universal supports so that learning experiences are accessible to all students from the onset of instruction. This might mean, for example, reading the context of a problem aloud so everyone can hear, even if there are some students who could access the problem without hearing it read aloud. Treating supports as universal minimizes the need to identify unique alternatives that could reinforce stigma or unintentionally prevent students from using a needed resource. As a curriculum committee, perhaps a small group of committee members decides to read an article about how UDL might look in mathematics classrooms specifically (e.g., Lambert, 2021). Using the information and examples in the article, the small group might then create a matrix based on the

three principles of UDL Math–Engagement, Representation, and Strategic Action. The matrix could include references to specific curricular materials and describe uses or adjustments that could increase accessibility. This matrix and other committee-developed resources could become meaningful supplements that aid enactment beyond the series adoption.

Another small group of committee members might read about strategies for maintaining the rigor of a task, while ensuring its accessibility. They might read about how learning opportunities, as posed via the curricular materials, have been historically limited for marginalized students, like students with disabilities, (e.g., Yeh et al., 2020). The small group might also investigate the specific mechanisms teachers can employ that decrease, maintain, or increase the rigor of a task (e.g., Lynch et al., 2018). Although focused on supporting students with disabilities, both readings provide actionable ways for teachers to adjust materials that honor the intent of the original task while ensuring that all students participate in grade-level lessons.

A Coherent View of What Constitutes High-Quality Materials May Foster Productive Committee Work

Our first and third research findings highlight the importance of committee coherence in selecting a series for use across a school district. In creating a multi-disciplinary curriculum committee, research indicates that understanding different perspectives can facilitate connections between disciplines in productive pursuit of a common objective (Choutou & Potari, 2024). The current study involved participants from different disciplines and roles within one school district, and yet they all had coherent perspectives about high-quality mathematics materials. This aligns with existing research on multi-disciplinary community collaboration, which suggests that people collaborating across disciplines should take the time to understand each other's perspectives, engage in dialogue, share resources, and address differences between disciplines (Hardré et al, 2013). Given the importance of there being shared ideas about what constitutes high-quality materials when adopting new curricular materials, we recommended that committee members establish a community of practice with shared understandings, perspectives, and purpose before the decision-making process begins (Wenger, 1998).

The Curriculum Director may play a crucial role in guiding the committee through the curriculum adoption process. As an introductory activity, the Director might ask the committee to complete a t-chart with a left-column heading that says, "It is important that materials are/have …" and a right-column heading that says, "... so that students can …" Sharing such views may spark conversation and press committee members to articulate what they value and why and, more importantly, identify points of convergence amongst the committee. The goal of this conversation would be to establish that the committee is working toward a shared vision and that future committee efforts will be grounded in common language and meaning. The Curriculum Director, acting as a broker between disciplines, can guide the team to hybridize practices from the varied disciplines towards a coherent view (Gleason, 2020), the importance of which is central to carrying out and sustaining instructional improvement (Cobb et al., 2020).

In such ongoing conversations, it is also important to recognize that different districts and contexts may require differing degrees of coherence or perhaps there are topics around which the district prioritizes higher degrees of coherence. For Unity School District, with respect to mathematics instruction, it was important that a representative contingency of educators had a part in selecting and implementing a common curriculum. Since previous norms in the district allowed individual teachers and schools to use a range of materials (which were not necessarily aligned to a shared set of curricular goals), it was important to this district to achieve the highest degree of coherence possible.

CONCLUSION

When districts go through the process of adopting a new curricular series, they have the opportunity to ensure that students in their district have access to materials that reflect rigorous and meaningful mathematics learning. Beyond material coherence, a committee's personnel coherence may be important for ensuring students who have been historically underserved also have access to rigorous and meaningful mathematics learning. This paper examines how one district's multi-disciplinary curriculum committee characterized high-quality curricular materials, including their perspectives about for whom those materials were considered appropriate and what alternative recommendations they would make. Our findings indicate that committee members can converge around a shared understanding of quality and material appropriateness, and ensure curricular alternatives increase accessibility while maintaining rigor. Each member of the committee brings an important personal and disciplinary perspective to the initiative. The group endeavor must begin with communication and the opportunity to identify points of convergence. Reflective engagement with the tasks and frameworks we recommend may support collective reimagining and generate previously unseen pathways for rich mathematical learning opportunities for all students.

REFERENCES

Association of Mathematics Teacher Educators. (2017). *Standards for preparing teachers of mathematics*. Author.

Battey, D. (2013). Access to mathematics: "A possessive investment in Whiteness". *Curriculum Inquiry, 43*(3), 332–359. https://doi.org/10.1111/curi.12015

Beckmann, S. (2004). Solving algebra and other story problems with simple diagrams: A method demonstrated in grade 4-6 texts used in Singapore. *Mathematics Educator, 14*(1), 42–46.

Berry, R. Q. III, Ellis, M., & Hughes, S. (2014). Examining a history of failed reforms and recent stories of success: Mathematics education and Black learners of mathematics in the United States. *Race Ethnicity and Education, 17*(4), 540–568. https://doi.org/10.1080/13613324.2013.818534

Callahan, R. M. (2018). *K–12 English learners' science and math education: A question of curricular equity*. National Academies of Sciences, Engineering, and Medicine.

CAST. (2018). *Universal design for learning guidelines version 2.2*. https://udlguidelines.cast.org/

Choppin, J., Davis, J., Roth McDuffie, A., & Drake, C. (2021). Influence of features of curriculum materials on the planned curriculum. *ZDM, 53*(6), 1249–1263. https://doi.org/https://doi.org/10.1007/s11858-021-01305-7

Choppin, J., Roth McDuffie, A., Drake, C., & Davis, J. (2022). The role of instructional materials in the relationship between the official curriculum and the enacted curriculum. *Mathematical Thinking and Learning, 24*(2), 123–148. https://doi.org/10.1080/10986065.2020.1855376

Choutou, C., & Potari, D. (2024). Investigating boundaries and boundary crossing between mathematics and visual art teaching in a collaborative setting. *Journal of Mathematical Behavior, 73*, N.PAG. https://doi.org.proxy2.library.illinois.edu/10.1016/j.jmathb.2024.101138

Cobb, P., Jackson, K., Henrick, E., & Smith, T. M. (2020). *Systems for instructional improvement: Creating coherence from the classroom to the district office*. Harvard Education Press.

Codding, R. S., Peltier, C., & Campbell, J. (2022). Introducing the science of math. *Teaching Exceptional Children*. Advance online publication. https://doi.org/10.1177/00400599221121721

Confrey, J., Gianopulos, G., McGowan, W., Shah, M., & Belcher, M. (2017). Scaffolding learner-centered curricular coherence using learning maps and diagnostic assessments designed around mathematics learning trajectories. *ZDM Mathematics Education, 49*, 717–734. https://doi.org/10.1007/s11858-017-0869-1

DeMatthews, D. (2020). Addressing racism and ableism in schools: A DisCrit leadership framework for principals. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, *93*(1), 27–34. https://doi.org/10.1080/00098655.2019.1690419

Fuentes, S. Q., & Ma. J. (2018). Promoting teacher learning: A framework for evaluating the educative features of mathematics curriculum materials. *Journal of Mathematics Teacher Education, 21*, 351–385. https://doi.org/10.1007/s10857-017-9366-2

Goos, M. & Bennison, A. (2018). Boundary crossing and brokering between disciplines in pre-service mathematics teacher education. *Mathematics Education Research Journal, (30)*, 255–275 https://doi.org/10.1007/s13394-017-0232-4

Gleason, D. (2020). The humanities meet STEM: Five approaches for humanists. *Arts and Humanities in Higher Education: An International Journal of Theory, Research and Practice, 19*(2), 186–206. https://doi.org.proxy2.library.illinois.edu/10.1177/1474022218806730

Hardré, P. L., Ling, C., Shehab, R. L., Nanny, M. A., Nollert, M. U., Refai, H., Ramseyer, C., Herron, J., & Wollega, E. D. (2013). Teachers in an interdisciplinary learning community: Engaging, integrating, and strengthening K–12 education. *Journal of Teacher Education, 64*(5), 409-425. https://doi.org/10.1177/0022487113496640

Hiebert, J., & Grouws, D. A. (2007). The effects of classroom mathematics teaching on students' learning. In F. K. Lester, Jr. (Ed.), *Second handbook of research on mathematics teaching and learning: A project of the National Council of Teachers of Mathematics* (pp. 371–404). National Council of Teachers of Mathematics.

Hirsch, C. R., & Reys, B. J. (2009). Mathematics curriculum: A vehicle for school improvement. *ZDM Mathematics Education, 41*, 749–761. https://doi.org/10.1007/s11858-009-0218-0

Jackson, K., Gibbons, L., & Sharpe, C. J. (2017). Teachers' views of students' mathematical capabilities: Challenges and possibilities for ambitious reform. *Teachers College Record, 119*(7), 1–43. https://doi.org/10.1177/016146811711900708

Lambert, R. (2021). The magic is in the margins: UDL math. *Mathematics Teaching: Learning & Teaching PK–12, 114*(9), 660–669. https://doi.org/10.5951/MTLT.2020.0282

Lewis, K. E. (2016, Feb 5). EduTalks: Katherine Lewis & difference not deficit. *YouTube*. https://youtu.be/j8ugY-7XkJQ

Lewis, K. E., & Fisher, M. B. (2016). Taking stock of 40 years of research on mathematical learning disability: Methodological issues and future directions. *Journal for Research in Mathematics Education, 47*(4), 338–371. https://doi.org/10.5951/jresematheduc.47.4.0338

Lynch, S. D., Hunt, J. H., & Lewis, K. E. (2018). Productive struggle for all: Differentiated instruction. *Mathematics Teaching in the Middle School, 23*(4), 194–201. https://doi.org/10.5951/mathteacmiddscho.23.4.0194

Mason, E. N. (2023). Teachers' views of the mathematical capabilities of students with disabilities: A mixed methods study. *Teachers College Record, 125*(2), 178–202. https://doi.org/10.1177/01614681231168170

Mason, E. N., & Thomas, E. R. (2021). Supporting students experiencing mathematics difficulty through interdisciplinary coaching: Lessons learned from a year-long partnership. *NCSM Journal of Mathematics Education Leadership, 22*(1), 51–66.

Matthews, L. E., Jones, S. M., & Parker, Y. A. (2022). *Engaging in culturally relevant math tasks, 6–12: Fostering hope in the middle and high school classroom*. Corwin.

McDuffie, A. R., Choppin, J., Drake, C., & Davis, C. (2018). Middle school mathematics teachers' orientations and noticing of features of mathematics curriculum materials. *International Journal of Educational Research, 92*, 173–187. https://doi.org/10.1016/j.ijer.2018.09.019

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. Author.

Newman, W. J. (2004). Serving on a mathematics text selection committee: A tale of woe. *School Science and Mathematics, 104*(8), 361–367. https://doi.org/10.1111/j.1949-8594.2004.tb18002.x

Noddings, N. (1995). Teaching themes of care. *The Phi Delta Kappan, 76*(9), 675–679.

Remillard, J. T., & Bryans, M. B. (2004). Teachers' orientations toward mathematics curriculum materials: Implications for teacher learning. *Journal for Research in Mathematics Education, 35*(5), 352–388. https://doi.org/10.2307/30034820

Saldaña, J. (2021). *The coding manual for qualitative researchers* (4th ed.). Sage.

Saxe, G. B., Gearhart, M., Franke, M. L., Howard, S., & Crockett, M. (1999). Teachers' shifting assessment practices in the context of educational reform in mathematics. *Teaching and Teacher Education, 15*, 85–105. 10.1016/S0742-051X(98)00032-8

Smith, M. S., & Stein, M. K. (1998). Selecting and creating mathematical tasks: From research to practice. *Mathematics Teaching in the Middle School, 3*(5), 344–350. https://doi.org/10.5951/MTMS.3.5.0344

Stein, M. K., Remillard, J., & Smith, M. S. (2007). How curriculum influences student learning. In F. K. Lester, Jr. (Ed.), *Second handbook of research on mathematics teaching and learning: A project of the National Council of Teachers of Mathematics* (pp. 319–369). National Council of Teachers of Mathematics.

van Garderen, D., Scheuermann, A., Jackson, C., & Hampton, D. (2009). Supporting the collaboration of special educators and general educators to teach students who struggle with mathematics: An overview of the research. *Psychology in the Schools, 46*(1), 56–77. https://doi.org/10.1002/pits.20354

Wenger, E. (1998). *Communities of practice: Learning, meaning and identity*. New York, NY: Cambridge University Press.

Wilhelm, A. G., Munter, C., & Jackson, K. (2017). Examining relations between teachers' explanations of sources of students' difficulty in mathematics and students' opportunities to learn. *The Elementary School Journal, 117*(3), 345–370. https://doi.org/10.1086/690113

Yeh, C., Sugita, T., & Tan, P. (2020). Reimagining inclusive spaces for mathematics learning. *Mathematics Teacher: Learning & Teaching PK–12, 113*(9), 708–714. https://doi.org/ 10.5951/MTLT.2019.0101

Zhao, M., & Lapuk, K. (2019). Supporting English learners in the math classroom: Five useful tools. *The Mathematics Teacher, 112*(4), 288–293. https://doi.org/10.5951/mathteacher.112.4.0288

Appendix A

Codebook

Theme	Thematic Code	Concept Code	
		Curricular **form or feature** considered to be high-quality	**Function or rationale** for why curricular form was considered high-quality
To reflect and reach a range of students (7)	Reach a range of students	adaptable	reflects a range of students
		appropriate for students	reach a wide population of students
		concrete and abstract reasoning	support a range of students, including those who are behind
		student collaboration	having students collaborate and so there's instruction from the teacher, more students can be reached
	Reflect a range of students	appropriate for students	connects students with materials
		connections to the real world	seeing math as important to their (students') lives
		cultural lens	seeing oneself
		engaging and interesting	related to students' lives
	Meet students' needs	adaptable	meet the needs of all students within the zone of proximal development
		differentiation	recognizing that every student is not the same, they have different learning styles so it's what students need
		standards-based	give students what they need to learn and be successful
To foster a sensical and meaningful learning experience (9)	Increase content continuity and comprehension	age-appropriate language of written materials	align the complexity of the text with students' age
		aligned with 8 mathematical practices	create continuity for students
		emphasis on vocabulary	start with a shared understanding of math terms
		hands-on/manipulatives	making the content more comprehensible
		supports for English learners	promote a shared understanding between people who speak different languages
		supports for English learners	decrease language demand
	Accurately assess student knowledge	age-appropriate language of written materials	ensure materials are assessing what they were intended to assess
		alternative assessments	demonstrate mastery in different ways
		flexible/adaptable	allows for multiple ways to assess what students know
		independent solving	demonstrate what students know
		materials that build on students' background knowledge	accurately assess what students know or don't know as they're learning new concepts
		opportunities for exploratory learning	get a baseline for what students know or (don't know) at the beginning of a unit
	Increase engagement and motivation	appropriate for students	take learning seriously, to buy in
		connections to the real world	make learning more exciting
		cross curricular	having fun
		cross curricular	create a context and reason for learning
		manipulatives	provide a tangible, memorable, and engaging way to represent concepts
		opportunities for student inquiry	affirms the way the student sees the world

			is valuable and that motivates them
	Promote independence and choice	engaging and interesting	promote student choice
		group work	de-center the teacher
		opportunities for student inquiry	promotes student ownership; students have control, power, and agency in the space
		present another way to understand the same concept	align with how students prefer to learn
		readable	students can learn independent of the teacher
To yield multiple learning outcomes, especially student thinking and understanding (12)	Attend to student understanding, reasoning, and meaning making	connect to students' backgrounds	making a concept concrete allows students to tap into their prior knowledge
		engaging	make meaning, actively
		engaging and interesting	support student understanding
		group work	promotes argumentation / reasoning
		hands-on	make connections, add layers to understanding, support the concept
		include common misconceptions	strengthen understanding
		manipulatives	make connections, understand the big concept
		manipulatives	understanding concretely is a prerequisite to abstract understanding
		multiple representations	children learn (using a variety of tools) and understand content better
		opportunities for collaboration	apply and solidify concepts
		scaffolding	support the student in making connections to prior material
	Promote learning and thinking	cross curricular	using different areas of the brain; increase learning
		group work	broaden notions of competence
		opportunities for enrichment	expand (not just add to) learning so different students could benefit at different times
		opportunities for exploratory learning	allows students to create and think
		opportunity to explain, think outside of the box	allows kids to be thinkers and problem solvers
		play	active learning through play
		rich/multilayered	demonstrating skills and application in a real-world context; student growth and thinking
		student collaboration	growth for students
		student discovery	use their (students') own brains
	Considering the future or "real world"	higher-order problems and fluency practice	what we needed for real life
		integrated	prepare students for the real world
		rich/multilayered	need jobs for the future (students)
	Promote procedural knowledge toward solving	cultural lens	knowing the context of what the problem is describing helps a student solve the problem (without first having to "solve" or make sense of the concept)
		opportunities for practice	drill and kill
		spiraling	go back to the basic skills and prepare for the next step

Note. In the Theme column, the number in parenthesis indicates the number of participants who articulated that theme.