

EQUITY AND ACCESS: EMPOWERING CHANGE AGENTS

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ABSTRACT

All learners must have access and opportunity to engage meaningfully in the highest levels of mathematics. Mathematics specialists are uniquely situated to contribute to the creation of access and equity for all learners by addressing three target areas with their mathematics teachers and administrators. In order to catalyze change, mathematics specialists need to be prepared to target three obstacles to access and equity: beliefs and expectations, curriculum and instruction, and intervention. This preparation can take place through leadership courses intentionally created to explore the role of change agent and provide practice in negotiating the role.

KEYWORDS

access, equity, catalyzing change, mathematics specialists

The National Council of Teachers of Mathematics' (NCTM) *Catalyzing Change* series (2020) and *Principles to Actions* (2014) call for systematic action and change so that all learners have access and opportunity to engage meaningfully in the highest levels of mathematics. NCTM (2020) makes four key recommendations to catalyze this change: broaden the purposes of learning mathematics, create equitable structures in mathematics, implement equitable mathematics instruction, and develop deep mathematical understanding. These actions require educators who both recognize this call and have the knowledge and skills to be catalysts of change in their schools and school divisions. The mathematics specialist preparation program seeks to intentionally develop a cohort of mathematics teacher leaders who contribute to this purposeful “move from ‘pockets of excellence’ to ‘systemic excellence’ by providing mathematics education that supports the learning of all students at the highest possible level” (NCTM, 2014, p. 2). The goal of this paper is to share the work of five mathematics specialists in catalyzing change.

Access and Equity Target Areas

In one university mathematics specialist preparation program, a sequence of three leadership courses ran concurrently with mathematics content courses in order to simultaneously develop the leadership and coaching skills of the candidates as well as their pedagogical content knowledge across the K–8 curriculum. The leadership courses explicitly addressed three target areas identified by NCTM (2014) in order to overcome obstacles to access and equity:

1. Beliefs and expectations of educators,
2. Curriculum and instruction, and
3. Interventions and support personnel (p. 64 – 66).

With each leadership course, we cycled back to deepen and broaden our understanding in these areas as well as to facilitate the transfer of knowledge and skills from the roles of mathematics teachers to mathematics coaches to mathematics data coaches.

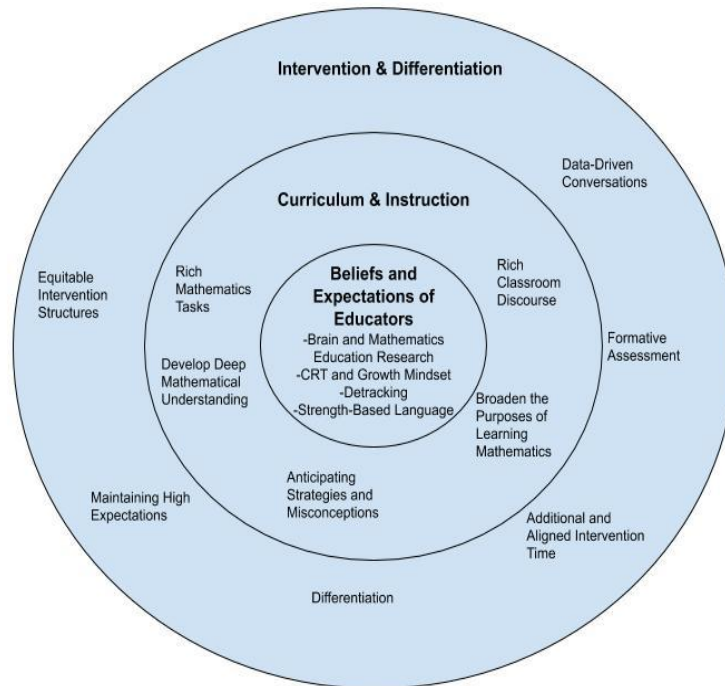
As mathematics specialists, we are uniquely situated to contribute to the creation of access and equity for all learners by addressing the three target areas with our mathematics teachers and administrators. While systematic change takes time, our initial learning and transfer are important steps along the path to catalyzing change. We will share the ways we learned deeply about these areas and changed our beliefs and expectations, how we used these shifts and insights to learn deeply about equitable mathematics curriculum, instruction, and intervention, and how we began the initial transfer from coursework to our daily practice in order to assume the role of change agents. Figure 1 is a graphic representation of our learning and our transfer work.

Beliefs and Expectations of Educators

In each of the leadership courses, we examined and reexamined our beliefs and expectations as educators in light of both learning theories and current research. We studied the learning theories of equity and access advocates, such as Carol Dweck, Gloria Ladson-Billings, Deborah Ball, and Rico Gutstein. We read and reflected on *Mathematical Mindsets* (Boaler, 2015) and *Culturally Responsive Teaching and the Brain* (Hammond, 2014) in order to use brain and mathematics-education research to explicitly correct myths and misconceptions. We conducted literature reviews in order to understand, appreciate, and teach in ways that engage

historically marginalized student populations, including learners with disabilities, English language learners, economically disadvantaged learners, African-American learners, and Latino learners.

Figure 1
Our Learning and Transfer to Practice



We experienced a range of shifts in our beliefs and expectations as educators. We began to see the equitable and inequitable structures in mathematics teaching and learning and have conversations about them. For some, our eyes were opened to inequities, while for others, our lived experiences with inequities were recognized and appreciated.

For example, we learned that students living in poverty are an infinitely diverse group who are repeatedly marginalized in schools through biases, inequitable access, and systemic classism (Gorski, 2013). Economically disadvantaged children may suffer high levels of environmental stress, which threatens brain development. Additionally, complex trauma, which is not confined to a single event, leads to feelings of hopelessness and desensitized emotions and can lead to significant changes in learners' brains that negatively affect their working memory (Hammond, 2014). Many times the historical marginalization of learners who live in poverty leads to challenges when learning and applying mathematics. From an early age, children living in poverty may be placed in groups labeled "low" which begins the track they will inevitably follow. This limits learners' self-concept, having a significant, adverse effect on learning (Haberman, 2010). These learners oftentimes face lower expectations of their thinking and ability, which can lead to many years of learning experiences that are not aligned with evidence-based best practices, such as building sense-making through high cognitive demand tasks and communicating ideas through discourse. Ability grouping continues to be a very common practice that protects and facilitates educators' deficit views and implicit bias related to class.

We reviewed related research to constructively examine inequities, and we developed the tools and learned the language to explicitly disrupt the beliefs and practices that sustain these inequities. This learning empowered us to initiate critical conversations with our teachers and administrators about their beliefs and expectations.

From Deficit to Strength-Based

We began by transferring our growing knowledge of brain research into our work in our schools. To be change agents, it was imperative to help the teachers and administrators in our schools understand neurological research and how it directly relates to learners. For example, Hammond (2014) explained how working memory can be engaged more effectively and efficiently for all learners when mathematical learning is grounded in sense-making, problem-solving, and connections to lived experiences. Boaler (2015) explained the power of brain plasticity to grow all mathematical thinkers through deep mathematical learning. As mathematics specialists who regularly meet with grade-level teams, Professional Learning Communities (PLCs), and Collaborative Learning Teams (CLTs) within our schools, we were able to protect time and provide learning resources to engage teams in unpacking brain research over a series of collaborative meetings. Teams considered questions such as, “How does this new knowledge challenge what we previously knew and did?” and “What will we do differently now?” Then, we facilitated teachers’ continual use of brain research in the planning of mathematics teaching and learning for all students.

Our work to revolutionize educator mindsets continued with intentionally planned learning conversations that moved teachers away from deficit models of thinking. For example, one first grade teacher reflected:

I have started to see just how much students are capable of understanding on their own. When I first started teaching math, I spent a lot of time showing children how to do math and get to the correct solution. Now I allow my kids to explore, experiment, and discuss. Very quickly, I saw that kids didn’t need me to tell them what to do or how to do math. They only needed me to give them opportunities to discover and opportunities to share what they know. I now feel willing to push the envelope and take risks in order to help our kids grow by leaps and bounds (personal communication).

Because we learned that systematic marginalization and deficit views often intersect with academic tracking, which, in turn, negatively affects all learners, we targeted the beliefs and expectations of teachers that result from tracking as well as promote and enable tracking. Rather than thinking of learners as those who can and cannot do mathematics, we pushed teams to examine the idea that no one is a “math person” and that everyone can learn mathematics.

Through the lens of brain research, we examined with our teachers how schema and connections are formed via productive struggle and making mistakes. For example, one third grade teacher said, “Giving the students the power to show their own strategies and thinking and teach each other their thoughts was very powerful and I think will help them gain confidence over time.” By being members of the team and actively participating in meetings, we were able to disrupt the labeling of learners, such as “low group” or “high group,” and instead facilitate in-depth discussions around student work analysis to focus on learners’ strengths and the next steps based on learning trajectories.

Gradually, team conversations evolved and became grounded in the belief that every learner deserves the opportunity and has the ability to be a mathematician and to engage in

inductive reasoning, mathematical argumentation, and meaningful discourse. Teachers began to recognize themselves as the creators and gatekeepers of these opportunities. Teachers' talk about learners became strength-based. Ultimately, having these sustained conversations around brain research, growth mindset, and systemic marginalization with teachers at our schools led to critical changes in their beliefs and expectations about learners as mathematical doers. As mathematics specialists, we were able to initiate these critical conversations with our teachers about their beliefs and expectations because our coursework prepared us with awareness, language, research, and tools, and because of our unique role within PLCs, CLTs, and team planning meetings in our schools. We were able to catalyze change in educators' beliefs and expectations.

Curriculum and Instruction

Across the three leadership courses, rich mathematical tasks resounded as an essential component of effective, equitable curriculum and instruction. Rich mathematical tasks (or high cognitive demand tasks) are mathematical problems that require learners to make connections among big ideas and do not have a clear, single path to a single solution (Boaler, 2015; Smith & Stein, 2011). We learned the significance of selecting or creating rich mathematical tasks aligned with learning goals, anticipating learner strategies and mistakes, and implementing the tasks in ways that maintain the depth of thinking and problem solving (Smith & Stein, 2011).

Implementing rich mathematical tasks is one way teachers enact their beliefs and expectations that all learners can learn and achieve mathematics at high levels. These tasks have high mathematical ceilings (i.e., can be extended and deepened) and low mathematical floors (i.e., can be accessed through multiple entry points using multiple strategies) so that all learners can engage in high cognitive demand problem solving and discussion. The power of rich mathematical tasks is reflected in the research we studied that shifted our beliefs and expectations (Boaler, 2015; Hammond, 2014) as well as in our deep examination of effective, equitable curriculum and instruction (Fennell et al., 2017; Hattie et al., 2017; Van de Walle et al., 2018). These tasks are inherent in two of NCTM's (2020) key recommendations for catalyzing change: broadening the purposes of learning mathematics and developing deep mathematical understanding. We practiced identifying, anticipating, and implementing rich mathematical tasks so that we could engage teachers in the same process through our roles as mathematics specialists.

Rich Mathematical Tasks and Embedded Professional Learning

Because mathematics specialists lead division-, school-, and PLC-level professional learning, we were able to collaborate with administrators to create sustained, embedded initiatives around rich mathematical tasks. To begin the school year, we engaged the teachers in our schools as learners: they collaborated, communicated, and used multiple representations and strategies to solve rich mathematical tasks. Then we facilitated reflective discussions about the ways rich mathematical tasks make lessons accessible and equitable for all learners. We examined the value of tasks with low mathematical floors and high mathematical ceilings as ways to ensure that historically marginalized learners have access to significant, meaningful, and deep mathematical content. We identified characteristics of rich mathematical tasks that allow for multiple entry points and problem-solving strategies, increase the growth mindset among all learners, and value a broad purpose for using mathematics and a personal connection with

mathematics. These initial explorations of rich mathematical tasks provided whole schools and grade-level teams with a common language and criteria for selecting rich mathematical tasks.

The professional engagement continued into grade-level team meetings, PLCs, and individual coaching sessions. As mathematics specialists, we regularly met with teachers throughout the school year in order to deepen and extend their understanding of rich mathematical tasks. Some PLCs worked as a team to plan common, rich mathematical tasks. Then they implemented the tasks in their classrooms and met as a team to analyze student work. Other mathematics specialists coached individual teachers as they planned, implemented, and reflected on their use of rich mathematical tasks.

In each case, we noticed the discussions became meaningfully focused on access and equity when teachers themselves engaged with the mathematical tasks first. This practice, called anticipating student strategies (Smith & Stein, 2015), was a regular part of our leadership coursework that we transferred to our daily work with teachers. When teachers anticipated, they considered tasks from the perspective of the learners, including mistakes that would make sense, common misconceptions, and a variety of strategies and solutions. During anticipation, each teacher solved the problem differently. Their strategies included the use of manipulatives, drawings, equations, and a combination. As the teachers shared their work, the conversation centered around how the task and its deep mathematical ideas were accessible across varying levels of mathematical knowledge.

Teachers began to value the careful selection of rich mathematical tasks that provide all learners with opportunities for productive struggle and rich mathematical discussions with peers. Teachers also valued tasks that enabled learners to reason at multiple levels and to draw upon their personal experiences, contexts, culture, and language. As mathematics specialists, we were able to facilitate these discussions and continue to move teachers' conversation, reflection, and practice forward around rich mathematical tasks. Rich mathematical tasks served as an opportunity to engage all learners, including and especially historically marginalized learners, in deep thinking and meaning making about mathematical concepts and skills. We used rich mathematical tasks as a tangible practice to enact beliefs and expectations that all learners can learn mathematics deeply and, therefore, to catalyze change.

Intervention

With each iteration of our leadership courses, we dove deeper into explicitly developing the tools for catalyzing change by addressing the three target areas that could be obstacles to access and equity in ourselves and in our schools. The third target area, intervention, is founded on the same principle as that of equitable beliefs and expectations and of equitable curriculum and instruction: all learners must have access and opportunity to engage meaningfully in the highest levels of mathematics (NCTM, 2014, 2020; Riccomini & Witzel, 2010; Tapper, 2012). In our coursework, we examined a variety of diagnostic and formative assessments (Fennell et al., 2017; Tapper, 2012) to inform intervention and differentiation strategies. We practiced taking on the roles of data coaches and interventionists by analyzing multiple levels of learner data including state-, division-, and classroom-level assessments, setting goals and adjusting instruction based on this analysis, and creating equitable, data-driven instruction and intervention (DuFour et al., 2016; Love et al., 2008). We increased our pedagogical content knowledge to become change agents through studies of the impact cycle (Knight, 2018) and the content coaching cycle (West & Cameron, 2013) with individuals and teams of teachers. Our course

work challenged us to negotiate our agency, or grow our efficacy, to create equity and access both within our cohort of fellow mathematics specialists and in our schools, and to catalyze change.

Data-Driven Conversations

As we engaged teachers and PLCs in data analysis to make instructional decisions, we relied on our growing pedagogical content knowledge to identify the foundational need in order to catalyze change. Many issues arising around intervention were closely linked to other instructional issues: some teams of teachers needed to examine their use of formative assessments, others needed to bolster their differentiation strategies, and others needed to create equitable structures in intervention.

We facilitated PLC meetings where the goal for teachers was to strategically meet each student's needs. In our coursework, we learned instructional time becomes more effective when teachers put a greater emphasis on formative assessments (NCTM, 2014). Utilizing formative assessments often during instruction allows teachers to make learning visible and to proactively adjust instruction in the moment to meet learners' needs (Fennel et al., 2017; Hattie et al., 2017). We put this learning into practice during PLC meetings by presenting different types of formative assessments to measure student progress, including documenting classroom discourse, concrete-representational-abstract (CRA) translations, and learners' recorded work of problem solving strategies and explanations (Berry & Thunder, 2017; Tapper, 2012; Van de Walle et al., 2018). The majority of the teachers were familiar with formative assessments; however, not all teachers were using or analyzing them. By committing to this work as a team and having a mathematics specialist to facilitate the work, teachers realized that intentionally using a variety of formative assessments and regularly analyzing the formative assessment data addressed their needs. They were able to make decisions about lesson pace and effectiveness as well as differentiated next steps, such as reteaching and extending. Formative assessments gave the teachers tools that maximized instructional time and more efficiently enabled them to analyze in-the-moment data.

Most importantly, formative assessments empowered teachers with the efficacy to share their areas of opportunities and best practices within PLCs in order to help their whole team improve access and equity for all learners. As teachers shared and analyzed formative assessments, they recognized areas of strength and opportunity within their own instruction. Together as a team, they supported each other in making intentional changes, using formative assessment to analyze those changes, and differentiating using rich mathematical tasks rather than ability grouping and lowering teacher expectations.

In addition, we identified teachers' need for differentiation strategies that maintained opportunities for deep mathematical understanding for all learners. In our coursework, we learned the importance and effectiveness of flexible grouping rather than tracking and labeling learners (Hattie et al., 2017). We also learned strategies for differentiating rich mathematical tasks, such as tiered problems, parallel tasks, and CRA modeling (Berry & Thunder, 2017; Tapper, 2012; Van de Walle et al., 2018). By coaching individual teachers, we were able to support selecting, practicing, and refining differentiation strategies that met learners' specific needs. These one-on-one conversations with teachers helped illuminate the idea that differentiated instruction comes hand in hand with equity and access by recognizing and appreciating the varying ways that students learn and process information.

Finally, we led regular data meetings where teachers discussed the interventions they put in place and their effectiveness. Based on these conversations, we learned the team's foundational need was to create equitable intervention structures. NCTM (2020) challenges teachers to maintain equitable structures by adding additional intervention time focused on problem solving and conceptual understanding to the grade-level instructional time rather than replacing it. In order for all learners to gain a deep conceptual understanding of mathematics, teachers need to revise and reframe intervention structures to use rich mathematical tasks combined with CRA modeling and focused on significant mathematical concepts and skills (Berry & Thunder, 2017; Riccomini & Witzel, 2010; Tapper, 2012). By analyzing formative assessment data, the team of teachers identified number sense, the foundation of the other content strands, as a pivotal area of need. We facilitated reflection and analysis of their grade-level number sense instruction, and teachers realized they needed to increase both the rigor and time spent developing all learners' number sense. Then, the team systematically planned ways to use intervention as a time for targeted learners to spend additional time growing their number sense with mathematics specialists through aligned instructional strategies, including rich mathematical tasks and CRA modeling. By facilitating data discussions, we were able to support teachers' evaluation and revision of their intervention structures. Together, we put interventions in place so all learners could succeed, and as a result, we catalyzed change.

The Mathematics Specialist: A Role of Advocacy

As mathematics specialists, we are uniquely positioned in our daily work with teachers, grade-level teams, PLCs, administrators, and learners to catalyze change. We can push teachers and administrators outside of their comfort zones in order to engage all learners in meaningful, mathematically rich experiences. At a school-level, we can begin and sustain the work to transform separated classroom instruction into collective mathematics learning (NCTM, 2020).

In order to catalyze change, mathematics specialists need to be prepared to target the three obstacles to access and equity focused on in this paper: beliefs and expectations, curriculum and instruction, and intervention. This preparation can take place through leadership courses intentionally created to teach and practice negotiating the role of change agent. Using tools, language, strategies, and research from coursework, mathematics specialists can then intentionally target teacher beliefs and expectations as well as curriculum, instruction, and intervention practices in their schools and school divisions. As we noted earlier, Figure 1 represents the learning we engaged in through our coursework and our transfer of this learning to practice. We advocate for this structure for mathematics specialists' training in order to systematically grow as change agents.

Mathematics specialists are often perceived as content experts, instructional coaches, interventionists, and data coaches. But at the heart of our work is the role of advocacy. We can help teachers see that "the question is not whether all students can succeed in mathematics but whether the adults organizing mathematics learning opportunities can alter traditional beliefs and practices to promote success for all" (NCTM, 2014, p. 61). Our answer to that question and our ultimate goal is to become the change agents in our schools and school divisions that instill that belief in our teachers and provide the tools for them to help make it a reality. We have begun the work of catalyzing change and will not stop until all learners have the access and opportunity to engage meaningfully in the highest levels of mathematics.

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