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COVID and Curriculum: Elementary Teachers Report on the Challenges of Teaching and Learning Mathematics Remotely

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Students are ready to learn, but not all have the same resources, technology knowledge, support, or internet access. This places some kids at a disadvantage from the start and others ahead of the game.

~ 3rd Grade Teacher

As the COVID-19 pandemic swept across the nation and the world, teachers worried about the differential impact of online schooling for children whose families had fewer economic resources. Historically marginalized students were persistently underserved before the pandemic, and teachers worried that time away from in-person learning would exacerbate differences in academic achievement. The purpose of this article is to report on the challenges teachers experienced with mathematics teaching, learning, and curriculum use during the pandemic and to explore educational inequities faced by students of families from lower income backgrounds. In particular, we were interested in differences across high- and low-income schools regarding teachers' perceived preparedness for online teaching, teachers' use and decisions about mathematics curriculum, and their students' remote resources (i.e., internet, computer, and workspace).

We administered a survey to 524 third- to fifth-grade mathematics teachers across 46 states during Fall 2020. We report on data from the survey that revealed specific inequities experienced by students from less-wealthy backgrounds that were exacerbated by the pandemic. Our analysis looked across schools by the percentage of students eligible for *free or reduced lunch* (FRL), a proxy for socioeconomic status. We found that students and teachers in schools with families of all levels of FRL faced hardship. However, schools where higher numbers of children qualified for FRL generally faced greater inequities in terms of access to computers, internet, and adequate workspaces.

As we emerge from this pandemic that has intensified the opportunity gap between students of low and high socioeconomic status, we conjecture there will be long-term implications of the differences in students' opportunities to learn. A further widening of gaps in opportunity and learning growth demands attention from policymakers, teacher educators, and other stakeholders to better support schools that serve students from low-income backgrounds.

Literature Review

When considering reasons for educational inequities, researchers have often turned to the curriculum. Studies have found that weak and unfocused curriculum is a major contributor to the learning gap between students from high and low socioeconomic backgrounds (Anyon, 1981; Schmidt et al., 1999). However, we argue that addressing curriculum gaps is not as simple as identifying an excellent curriculum and mandating its use. For instance, there have been multiple debates over what counts as a high-quality curriculum, especially in the area of mathematics (e.g., Wilson, 2008). In

addition, a curriculum is far more than the teacher guide and student workbooks. It includes not only multiple physical resources, but also the ideas, philosophies, stances, practices, beliefs, strategies, and learning theories—embedded in the materials and held by teachers—that interact to influence the transformation from written curriculum to enacted curriculum (Remillard & Heck, 2014).

The notion of a curriculum has also changed quite a bit over the past decade as online curricula have become increasingly available and popular. Teachers are no longer turning to a single textbook but are incorporating technology and manipulatives (Pepin et al., 2013) and online resources (Sawyer et al., 2020). While this is a fairly new and thus understudied phenomenon, emerging findings suggest that there are both benefits and limitations for teachers and students in the increasing use of online curriculum sites such as *TeachersPayTeachers* and *Pinterest* (Pittard et al., 2017; Shelton & Archambault, 2019; Torphy et al., 2020).

The equity implications of this changing curriculum landscape are also yet to be fully understood, particularly in the context of teaching and learning during the pandemic. Nonetheless, prior research on teachers' curriculum use in a pre-online curriculum era suggested that teachers of students from lower income communities were more likely to choose and use rote, low-level curriculum materials (Anyon, 1981). In the online era, it seems likely that teachers working in lower-income schools might have less access to the material resources or the professional learning opportunities necessary to supplement their curriculum materials in coherent ways. At the same time, however, a RAND report found that teachers in schools with FRL levels greater than 75% were more likely to use online resources than teachers working in schools with lower FRL levels (Opfer et al., 2016). Pittard (2017) found that one reason teachers in low-income districts turned to online resources was because their core curriculum was outdated and the school had insufficient funds to purchase newer curriculum. In our survey, we found another reason that teachers turned to supplemental resources (and/or created their own resources) was when their core curriculum was not culturally relevant to the lives of their students. For example, a teacher we surveyed shared, "I would have to find ways to connect to students' lives more."

Further complicating the story of pandemic-related educational inequities are the digital divides that exist across families of different economic backgrounds and across teachers at schools serving families with different economic backgrounds. According to a Pew Research Report (Anderson & Kumar, 2019), only 54% of families with incomes less than $30,000 had home high-speed internet access. These same families owned computers at about the same rate (54% had a desktop or laptop computer and 36% had a tablet). In contrast, 94% of families with incomes above $100,000 had home internet, 94% had a computer, and 70% had a tablet computer. As a consequence, higher income families were much more likely to have the technology resources to support the shift to online schooling.

At the same time, teachers vary in their comfort with and use of technology. One study reported that teachers from urban (and presumably less affluent) schools were less likely to use technology for classroom communication, formative assessment, web-based document creation, or learning management than their suburban (and presumably more affluent) peers (Kormos, 2018). Another study found that teachers from schools whose families were lower income were more likely to avoid using

computers or to use computers for assessment activities than they were to use computers for more student-centered learning activities (Graves & Bowers, 2018). These findings suggest the potential for differential learning opportunities for students from high income families and those from lower income families. As learning shifted online to a more technology-dependent delivery, students from higher income families may have been likely to benefit more from both better access to technology and from teachers who were more comfortable and facile with constructing student-centered lessons.

The literature suggests several ways in which mathematics teaching and learning might vary for students from different economic backgrounds. In this article, we explore teachers' survey responses to questions about mathematics teaching during the pandemic and then analyze this data for differences connected to student eligibility for FRL.

Methods

Prior to COVID, we had proposed a study with a mixed method design to investigate curriculum coherence given differing patterns of teacher curricular resource use in the quickly expanding landscape of available curriculum materials, particularly online materials available both for free and for a charge. We intended to conduct a national survey to report which curricular resources teachers were using, how they were using those resources, and what contextual influences impacted their use. Then, using these findings, we would construct cases that illustrated the range of teacher-curriculum interactions and work with teachers to create toolkits to support more coherent and responsive curriculum use. The pandemic, of course, changed all this. Appropriately, the decision was made to investigate teachers' use of curricular resources prior to and during the pandemic. We examined the experiences of teachers related to mathematics teaching, learning, and curriculum use before the pandemic, during the onset of the pandemic (Spring 2020), and when school resumed in Fall 2020 with the pandemic still ongoing. We sought to compare the similarities and differences in decisions and experiences faced by teachers across these time periods and across levels of FRL. When reporting on findings related to FRL levels, we distinguish among four categories (see Table 1).

Table 1

Free and Reduced Lunch (FRL) Level Categories

Category	Percentage of Students Receiving FRL at School
Low	0% to 14%
Medium	15% to 49%
Medium High	50% to 74%
High	75% or more

In alignment with our original plan, we began our study by administering a national survey to teachers. We utilized the services of MDR, a marketing company with considerable experience surveying teachers, to assist us with survey design, administration, and analysis. We requested a sample of at least 500 teachers who teach mathematics in grades 3, 4, or 5. MDR attempted to select these teachers from each state, from all metro types, and across school FRL levels. Our resulting sample consisted of 524 teachers across 46 states. Teachers from grades 3, 4, and 5 were relatively evenly represented in the responses, and the vast majority of them identified as women. The majority of the teachers had earned at least a master's degree and had been teaching for at least 10 years. (See Table 2 for teacher demographic information).

Table 2

Teacher Demographic Information

Teachers	*n*	%
Grade Levels Taught		
3	190	36.3
4	215	41.0
5	198	37.8
Highest Education		
Bachelor's	181	34.5
Master's	317	60.5
Doctorate	11	2.1
Other	15	2.9
Years of Experience		
Less than 5	35	6.7
5 to 9	113	21.6
10 to 19	200	38.2
20 to 29	122	23.3
30 or more	47	9.0
Gender Identity		
Woman	460	87.8
Man	53	10.1
Non-binary/none/x	3	0.6

In Table 3, we summarize description of the schools.

Table 3

School Descriptive Information

Schools	*n*	%
Metro Type		
Urban	149	28.4
Suburban	285	54.4
Rural	88	16.8
Sector		
Public	474	90.5
Charter	19	3.6
Private	15	2.9
Parochial	11	2.1
FRL Levels		
0 to 14%	73	13.9
15% to 49%	108	20.6
50% to 74%	102	19.5
75% or more	222	44.0

The vast majority of the schools represented by the responding teachers were public; although more than half of the schools were suburban, nearly 30% of the teachers taught in urban schools. Two-thirds of the schools had FRL rates of at least 50%.

In the survey, we defined m*athematics curriculum materials* as any materials used by teachers for the purposes of planning, teaching, and/or assessment. This included "packaged curriculum" (e.g., textbooks, pacing guides); individual lesson plans, activities, and materials; and electronic and online resources and apps, and so forth. This also included textbooks and teacher guides purchased by a school (such as *Houghton Mifflin Math*), online curricula (such as *Engage NY*), online resources (such as *IXL, Zearn*, or *BrainPOP*), or materials teachers downloaded from sites (such as *TeachersPayTeachers*).

We asked the teachers questions about the mathematics curriculum materials they used in September 2019–February 2020 (prior to the COVID-19 pandemic) and March 2020–June 2020 (early in the COVID-19 pandemic), and the mathematics curriculum they planned to use in September 2020–December 2020 (during COVID-19 in the Fall 2020 semester). We provided specific curricular options for them to select from (See Table 4); respondents could also select "I designed my own materials," "Other (please specify)," or "None of the above." Once the curriculum materials used were established during each time period, we asked questions about changes in the curriculum reported from one period to the next: "Why did you start/stop using [insert curriculum name here] when you started teaching remotely? Enter your response in the box below."

Table 4

Survey Curriculum Options

Core Curriculum	Supplemental Curriculum	Open Response
Go Math	TeachersPayTeachers	Designed my own
Investigations	Pinterest	Other
Bridges	IXL	
Big Ideas Math	BrainPop	
Math Expressions	Zearn	
Envision Math		
Math in Focus		
Everyday Mathematics		
Engage NY/Eureka		

We also asked teachers to report their feelings of preparedness for teaching remotely early in the pandemic (Spring 2020) and in Fall 2020, as well as how much control they had over mathematics curricular decisions during COVID-19 and who else controlled those decisions. We asked them what percentage of their students seemed to have sufficient access to technology to effectively engage in online remote learning and what barriers existed for students when it came to online remote learning (e.g.,

No/poor/shared access to a computer or tablet, No/poor/shared working space). Descriptive frequency data for the full sample and for groups based on school FRL levels are reported. In addition, one-way analysis of variance was used to investigate whether teacher responses varied by school FRL level. We also conducted thematic analysis (e.g., Braun & Clarke, 2006; Nowell et al., 2017) on the set of responses to each open-ended question to further understand teachers' perceptions of their experiences teaching mathematics remotely in the context of COVID-19. Using terms defined by Braun and Clarke (2006), our "data corpus" was the set of 524 teacher survey responses, with each individual survey treated as a "data item," and each teacher response to each question was a "data extract." Thematic analysis offered a flexible methodological approach to find repeated patterns of meaning and issues of potential interest and importance through a collaborative examination of the open-ended questions in the large data corpus. The research team began familiarizing ourselves with the data by working in pairs to focus on a particular set of data extracts (i.e., teacher responses to one open-ended question) for the set of all 524 respondents. The partners individually reviewed each data extract; generated initial codes (i.e., interesting and potentially important features of the data); and collated the codes into potential themes, gathering data extracts related to each theme. The partners then met to review the themes, comparing and contrasting their categories in order to develop and name a set of agreed-upon themes, selecting compelling extract examples to illustrate the themes.

Findings

In this section, we report our findings on teachers' perceptions of preparedness to teach during the shift to online learning, the curricular choices they made, the challenges they faced, and the inequities seen across contexts and circumstances. Nearly all responding teachers reported a shift to online instruction as a result of the pandemic. The majority (64%) worked in schools in which half or more of the students were eligible for FRL, and many (44%) worked in schools in which 75% or more students were eligible for FRL. We conclude with statements made by teachers that express the challenges they were experiencing first-hand.

Preparedness to Teach Remotely

When asked to rate their level of preparedness for online instruction as *completely, a lot, a bit,* or *not at all,* the majority of teachers indicated *not at all* prepared (58%) followed by *a bit* prepared (34%) for online instruction. In total, this amounts to 92% of responding teachers reporting low levels of preparedness. When looking at teacher preparedness in schools across all four FRL levels, we found no statistically significant differences [$F(3, 498)= 2.467$, $p= .061$], meaning that regardless of financial status of the families attending the school, teachers felt unprepared for the abrupt shift to online instruction. This seems reasonable considering that most teachers' experiences and preparation had been focused on teaching children in face-to-face contexts.

Curricular Choices and Decisions

When asked about how much control teachers felt they had over their curricular decisions during the pandemic, the majority of teachers (about 60%) across each of the four levels of FRL reported having little or no control of their curriculum, with no significant differences in teacher control of

curricular decisions across FRL levels [F(3, 501)= .798, *p*= .495]. These findings (see Table 5) about levels of control are roughly consistent with other reports which suggest that teachers in the United States generally have little control over curriculum decisions (OECD, 2013).

Table 5

Teacher Control of Curricular Decisions by FRL Levels

FRL Levels	Teacher Control							
	None at all		A bit		A lot		Complete	
	n	%	*n*	%	*n*	%	*n*	%
0% to 14%	15	20.5	26	35.6	24	32.9	8	11.0
15% to 49%	17	15.7	50	46.3	24	22.2	17	15.7
50% to 74%	21	20.6	36	35.3	35	34.3	10	9.8
75% or more	51	23.0	90	40.5	60	27.0	21	9.5
Total	104	20.6	202	40.0	143	28.3	56	11.1

We also looked at use of teacher-created resources from *TeachersPayTeachers* and *Pinterest* and found no significant differences across FRL levels. Approximately half of the teachers working in schools across all four levels of FRL reported using materials from *TeachersPayTeachers* across all time frames (prior to the pandemic, early in the pandemic, and middle of the pandemic). Essentially, teachers, regardless of their reported control over curricular decisions, were just as likely to access a teacher-created curriculum, including resources developed by other teachers on *TeachersPayTeachers* and *Pinterest*.

At the onset of the pandemic, the frequency to which teachers were looking for existing supplemental curriculum (e.g. *TeachersPayTeachers, Pinterest, BrainPop, IXL,* etc.) decreased, but the frequency with which teachers designed their own materials increased. We were not surprised by this finding considering that most existing supplemental materials have been created for in-person contexts, which means that, with no core or supplemental curricula conducive to online contexts that were readily accessible, teachers were forced to develop their own materials even more often than they already had been developing materials.

When asked, "What factors, if any, influenced the decisions and/or changes you made related to your mathematics curriculum due to COVID-19?" the most frequent selection, not surprisingly, was that materials had to be adapted for online learning (62%). However, also often selected were responses related to issues of potential inequities, including the adaptation of materials: (a) to support equitable access to learning (59%), (b) to provide resources to support students with diverse learning needs (56%), (c) for families to better support students (52%), (d) due to lack of internet access (43%), and (e) to prioritize student well-being over academic progress (38%). Table 6 describes the factors across all FRL levels.

Table 6

Factors That Influenced Teachers' Decisions Regarding Adapting Curricular Materials

Factors	FRL Levels									
	0% to 14%		15% to 49%		50% to 74%		75% or more		Total	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Curriculum did not have online materials	42	57.5	73	67.6	63	61.8	137	61.7	315	62.4
Support equitable access to learning	32	43.8	63	58.3	59	57.8	142	64.0	296	58.6
Support students with diverse learning needs	35	47.9	58	53.7	54	52.9	135	60.8	282	55.8
Ensure critical mathematics content was covered	40	54.8	69	63.9	43	42.2	120	54.1	272	53.9
For families to better support students	35	47.9	59	54.6	48	47.1	121	54.5	263	52.1
Students did not have internet access	21	28.8	36	33.3	50	49.0	109	49.1	216	42.8
Prioritize student wellbeing over academic progress	25	34.2	50	46.3	41	40.2	78	35.1	194	38.4

While all teachers were forced to adapt their curriculum to online contexts and attend to students' well-being regardless of FRL, we did see some adaptation types that differed across FRL levels. For instance, high FRL schools experienced greater instances of students without internet access

and other barriers and thus in need of support for equitable access to learning.

Challenges of Teaching Online

While teachers did their best to adapt their curriculum to meet the demands of online instruction and the diverse needs of their students, they still faced several challenges outside the realm of their control. Importantly, these challenges varied between high and low FRL schools. When we asked teachers about barriers to learning, 70% reported that many of their students had no/poor/shared internet access. For teachers working in high FRL schools, 78% of the students faced these challenges compared to only 44% in low FRL schools. While internet access was essential for online school, we also wanted to know whether students had access to a computer or tablet. More than half (60%) of teachers reported teaching many students with no/poor/shared access to a computer or tablet. Access to a computer or tablet was a challenge across FRL levels. However, the teachers working in districts with high FRL reported more students without adequate access (65%), while only 38% of teachers working in low FRL schools reported inadequate computer/tablet access. Additionally, 50% of teachers reported that many of their students had no/poor/shared working spaces in their homes. Of the teachers working in districts with high FRL, 56% of them reported inadequate work spaces, while 36% of teachers in low FRL schools reported this. (See Table 7 for barriers by FRL levels.) In summary, from the perspective of classroom teachers, students from lower socioeconomic backgrounds had less online access to their teacher and were in situations that limited their ability to engage in online learning. While we do not yet know the outcomes of these differences in online experiences, there are many reasons to believe that reduced access to the teacher and lessons will mean less robust learning outcomes.

Table 7

Barriers to Student Learning by FRL

FRL Levels	Barriers					
	Internet Access		Computer or Tablet Access		Working Space	
	n	%	*n*	%	*n*	%
0% to 14%	32	43.8	28	38.4	26	35.6
15% to 49%	73	67.6	60	55.6	50	46.2
50% to 74%	78	76.5	68	66.7	52	48.1
75% or more	172	77.5	145	65.3	125	56.3
Total	355	70.3	301	59.6	253	50.1

In response to an open-ended question about barriers to learning, teachers listed several challenges they faced in connecting with students and delivering instruction. Teachers reported a lack of adult availability/ability to help their children with technology issues. For example, one teacher wrote about how her students are "missing instruction due to lack of family support or internet issues," and another teacher similarly expressed that "some students still struggle with technology and [there is a] lack of adults who can help at home." Teachers also mentioned that usually their elementary mathematics lessons were very hands-on, so it was difficult to teach the content without physical manipulatives. For instance, a teacher wrote, "I need to work with students in person ... I need to see them working with manipulatives to learn the conceptual side first," and another stated, "Math is hard to [teach] digitally. It's much more hands on than reading, and without that hands-on support, student engagement is lost." Teachers also faced challenges in assessing students. For example, one teacher explained, "It is harder to assess the students at home and hold those students accountable. I feel I am able to provide more feedback in person. It is harder through *Google Meet*." Another teacher expressed the thought that "tests are unreliable due to home environments." In addition, teachers

reported a need for more support for students with special needs. For instance, one teacher mentioned, "Average and above students can learn math remotely fairly well. Students with special needs struggle to keep up." Another teacher mentioned nothing more than that she "just [needs] more support for special needs students." Teachers also expressed challenges in establishing genuine relationships with students. For instance, one teacher stated, "It is going to take longer to develop and really know them," and another said, "Is hard to develop the relationships with the students through *Google Meet*."

Engaging students (in general) was a topic that came up often, and teachers mentioned that the lack of engagement was impeding learning. For example, this teacher stated, "We are about 6 weeks into this now, and the student engagement piece is becoming a huge barrier to success for many students." Another teacher said, "The students are not as engaged online, they are often off task. It is evident when a student is off task because they are not facing their devices." Overall, teachers just expressed decreased levels of student focus and motivation from home. For example, "Many students had to be motivated to get on the computer and complete assignments. Parents had to support [this]" and "There are just too many distractions in the students' homes for it to be successful." We found that these decreased levels in focus and motivation were highest in schools with high FRL levels and amongst students with the highest cases of no/poor/shared access to workspaces and technology.

Statements from Teachers

In this section we provide supplementary statements from teachers that exemplify the challenges of teaching during the pandemic, their efforts to make the best of the circumstances, and the inequities they noticed. In regard to the first, teachers across school FRL levels noted that remote teaching was challenging in many ways, including connecting with students and families, monitoring student progress, managing expectations, and teaching mathematics content in meaningful ways. Teachers expressed this in a variety of ways:

- *It is a completely different job from teaching in person and it is very difficult.*
- *It is hard to develop the relationships with the students through google meet* [*sic*]. *It is very hard to hold students accountable for their work. I have noticed lower grades of students at home compared to me in person. Also, the students in class do not have missing assignments, but the kids at home have a ton. They get the same time to complete the work, so I am not sure what is going on.*
- *It is absolutely terrible to teach 5th grade remotely. If I see a student in a tiny square on Zoom, I cannot see what that student is really doing on paper … Connectivity is an issue, poor internet is a big issue. Certain websites don't work properly, we get bumped off Zoom frequently.*
- *After 10 years of teaching, I've never struggled so much. I've spent countless hours planning and prepping. It's frustrating when you constantly are trying to adapt to the needs of the students and the parents and admin continue to expect you to do more.*
- *It is more challenging to teach math virtually than any other subject. Math needs to be explored and 'touch'* [*sic*] *so students can count and visualize.*

Secondly, teachers' responses indicated that they were committed to making the best of the circumstances for their students, often using new strategies to reach them, connect with families, and provide resources. Here are a few quotes:

- *When needed,* [*Microsoft*] *Team's* [*sic*]*meetings were sent* [*sic*] *up for individual students or small groups of students to supplement learning.*
- *Seemed like they were struggling so I offered phone help.*
- *If students were not turning in the work, I reached out to families to see how I could support them in engaging with the work. Also, if kids struggled, I would reteach concepts.*
- *I would make a video of the concept and send it to them. They would have to make me a video explaining how they did a problem. This would happen a couple of times and then they would take a quizizz* [*sic*] *with problems.*

A third notion on the minds of teachers as they completed the survey was issues related to equitable learning opportunities:

- *It was incredibly difficult. Our school is in an area stricken by poverty, so many students didn't have access to technology, and didn't have parental support at home. [It] felt like we were fighting a losing battle because our students wouldn't complete any of the work no matter what we did to try to make connections with them or encourage them. There was a TON of learning loss, and we are seeing the impact of that now that we have our kiddos back in the classroom with us. I feel that teaching elementary aged students is really only successful when we are teaching face-face, they thrive off of peer interaction, and we now can truly see the importance of it.*
- *Students are ready to learn, but not all have the same resources, technology knowledge, support, or internet access. This places some kids at a disadvantage from the start and others ahead of the game.*
- *I knew that I would have to find ways to connect to students' lives more. I also knew that there was going to be a problem with equity*.

Many teachers were concerned about the equity issues tied to online teaching, and they were eager to provide additional supports in the form of videos, small group learning, and one-on-one time. These supports represent a range of tried-and-true responses to struggling students (like reteaching) as well as more innovative ways to connect to students (like videos).

Discussion

In many ways, the impacts of the pandemic on mathematics teaching and learning were similar for teachers and students, regardless of students' economic backgrounds; however, students of lower income backgrounds faced greater inequities. Unsurprisingly, when the pandemic first started, teachers across the nation were unprepared to teach online, but felt more prepared as school restarted in the fall. Also, as teachers from schools in all economic groups moved to online settings, they moved away from existing supplemental curriculum materials (like *BrainPop* and *IXL*) and began creating more of their own materials.

We found, like Opfer et al. (2016), that teachers from schools of both high and low FRL levels were using online teacher-

created curricula. However, in contrast to Opfer and colleagues (2016), our findings showed that similar percentages of teachers from both high- and low-FRL schools were using online curriculum. In spite of this, we do not know whether teachers from schools with different FRL levels were accessing the same kinds of materials or using them in similar ways. However, given research about differences in teachers' use of technology (Graves & Bowers, 2018; Kormos, 2018), it is likely that teachers from schools with different FRL levels were making different curricular decisions. Also, teachers specifically stated that they were modifying curriculum to better meet the needs of their students; however, given that teachers' perception of student needs varied based on the FRL rate of schools, these curriculum modifications could have been quite different for different groups of students. There is more to be learned about how teachers might vary in their selection of and modification of technology-related curriculum.

We found differences in reporting about barriers to learning across teachers of students from high- and low-FRL schools, with teachers in schools with higher percentages of FRL reporting more barriers such as limited internet and computer access and limited home learning spaces. Notably, teachers' open-ended comments reflected concerns about additional learning inequities arising from the pandemic and tied to students' families and home environments. For example, one teacher cited earlier described students as "stricken by poverty" and connected poverty with lack of access to technology and lack of parental support. This linkage between poverty and technology and families is echoed across societal discourse (Anderson & Kumar, 2019; Ong, 2020). This teacher's comment repeats frequently told stories of poverty as connected to academic failure (DeWitt, 2014). This is unsurprising as there is no reason to believe that a pandemic would affect what have been historically resilient narratives of blame and oppression, or that in a time of crisis we would find radically different framings of persistent structural inequities.

While we identified ways in which teachers were making the best of their circumstances, more exploration and recognition are needed in relation to the successes that students and teachers found during remote learning. For example, teachers and students became much more adept with technology (Hood, 2020). In addition, the unfamiliar territory of the online classroom brought teachers together to collaborate more—through troubleshooting technology, brainstorming engaging yet accessible virtual learning activities, and learning from one another's successes and challenges (Hood, 2020). Additional research could probe how improved technology skills and collaboration change teaching and learning post-COVID. The pandemic also reminded the world that students are *children*, meaning that emphasis on social-emotional learning should be a priority over standardized testing and that student voice should guide instruction (Hood, 2020).

In summary, our data showed that teachers made many adjustments to their curriculum in an effort to support student learning in a remote environment. Oftentimes, teachers needed to invent their own materials as the available curricula did not meet the realities of at-home, online learning. And while teachers were aware of potential inequities tied to differential access to the internet, the structures of society and schooling meant that there was little they could do to correct them.

Conclusion

In this article we reported on the challenges that teachers across the nation experienced with mathematics teaching, learning, and curriculum use during the COVID-19 pandemic. In particular, we looked across school FRL levels to examine differences in teachers' preparedness for online teaching, teachers' use and decisions about mathematics curriculum, their students' remote resources (i.e., internet, computer, and workspace), and other challenges (e.g. building relationships, maintaining engagement, assessing learning outcomes). We found that while some factors (e.g. preparedness to teach online, control of curricular decisions) did not significantly differ across low- and high-income schools, other factors (e.g. access to computer/tablet/working space, engagement) did. The educational inequities experienced by students from low income backgrounds became further exacerbated by the pandemic, suggesting that we may see further widening of gaps in learning growth between students of low- and high-socioeconomic backgrounds. This is an area in need of further exploration, with implications for policymakers, teacher educators, and other stakeholders seeking to advance equity and justice for less wealthy students.

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Appendix A

Table 1

Free and Reduced Lunch (FRL) Level Categories

Category	Percentage of Students Receiving FRL at School
Low	0% to 14%
Medium	15% to 49%
Medium High	50% to 74%
High	75% or more

Appendix B

Table 2

Teacher Demographic Information

Teachers	*n*	%
Grade Levels Taught		
3	190	36.3
4	215	41.0
5	198	37.8
Highest Education		
Bachelor's	181	34.5
Master's	317	60.5
Doctorate	11	2.1
Other	15	2.9
Years of Experience		
Less than 5	35	6.7
5 to 9	113	21.6
10 to 19	200	38.2
20 to 29	122	23.3
30 or more	47	9.0
Gender Identity		
Woman	460	87.8
Man	53	10.1
Non-binary/none/x	3	0.6

Appendix C

Table 3

School Descriptive Information

Schools	*n*	%
Metro Type		
Urban	149	28.4
Suburban	285	54.4
Rural	88	16.8
Sector		
Public	474	90.5
Charter	19	3.6
Private	15	2.9
Parochial	11	2.1
FRL Levels		
0 to 14%	73	13.9
15% to 49%	108	20.6
50% to 74%	102	19.5
75% or more	222	44.0

Appendix D

Table 4

Survey Curriculum Options

Core Curriculum	Supplemental Curriculum	Open Response
Go Math	TeachersPayTeachers	Designed my own
Investigations	Pinterest	Other
Bridges	IXL	
Big Ideas Math	BrainPop	
Math Expressions	Zearn	
Envision Math		
Math in Focus		
Everyday Mathematics		
Engage NY/Eureka		

Appendix E

Table 5

Teacher Control of Curricular Decisions by FRL Levels

FRL Levels	Teacher Control							
	None at all		A bit		A lot		Complete	
	n	%	*n*	%	*n*	%	*n*	%
0% to 14%	15	20.5	26	35.6	24	32.9	8	11.0
15% to 49%	17	15.7	50	46.3	24	22.2	17	15.7
50% to 74%	21	20.6	36	35.3	35	34.3	10	9.8
75% or more	51	23.0	90	40.5	60	27.0	21	9.5
Total	104	20.6	202	40.0	143	28.3	56	11.1

Appendix F

Table 6

Factors That Influenced Teachers' Decisions Regarding Adapting Curricular Materials

Factors	FRL Levels									
	0% to 14%		15% to 49%		50% to 74%		75% or more		Total	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Curriculum did not have online materials	42	57.5	73	67.6	63	61.8	137	61.7	315	62.4
Support equitable access to learning	32	43.8	63	58.3	59	57.8	142	64.0	296	58.6
Support students with diverse learning needs	35	47.9	58	53.7	54	52.9	135	60.8	282	55.8
Ensure critical mathematics content was covered	40	54.8	69	63.9	43	42.2	120	54.1	272	53.9
For families to better support students	35	47.9	59	54.6	48	47.1	121	54.5	263	52.1
Students did not have internet access	21	28.8	36	33.3	50	49.0	109	49.1	216	42.8
Prioritize student wellbeing over academic progress	25	34.2	50	46.3	41	40.2	78	35.1	194	38.4

Appendix G

Table 7

Barriers to Student Learning by FRL

FRL Levels	Barriers					
	Internet Access		Computer or Tablet Access		Working Space	
	n	%	*n*	%	*n*	%
0% to 14%	32	43.8	28	38.4	26	35.6
15% to 49%	73	67.6	60	55.6	50	46.2
50% to 74%	78	76.5	68	66.7	52	48.1
75% or more	172	77.5	145	65.3	125	56.3
Total	355	70.3	301	59.6	253	50.1