

USE OF TEACHER-CREATED CURRICULAR RESOURCES BY ELEMENTARY MATHEMATICS TEACHERS: BEFORE AND DURING THE COVID-19 PANDEMIC

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This study explores elementary teachers' use of mathematics curricular resources before and during COVID-19. We administered a survey to a national sample of third through fifth grade teachers. The findings show the prevalence and increased use of teacher-created materials during the pandemic. This has implications for researchers and administrators as they consider how to best support teachers in designing their own curricular materials, especially for diverse learning contexts.

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Even before COVID-19 upended classrooms, teachers' use of mathematics curriculum was shifting. Many teachers no longer relied on or had access to sets of materials from textbook companies. Instead, pre-pandemic anecdotal evidence suggests an increasing popularity of online, teacher-created curricular materials (e.g., Gewertz, 2014; Monahan, 2015; Ross, 2015). Research has documented teachers' use and modification of published curricular materials (e.g., Choppin, 2011; Remillard, 2005; Sherin & Drake, 2009). These researchers report modifications such as changing physical materials, omitting parts, reorganizing features (such as ungrouping sets of problems), and adding transitional activities to lessons. However, the shift to online resources and teacher-created curriculum is a more dramatic change in teachers' use of curricular materials and one that we know little about.

In this study, we seek to describe the curricular landscape for upper elementary mathematics curricula before and during the pandemic. In particular, we are interested in making sense of what materials teachers are using, including teacher-created materials, and how they are making their curricular decisions.

Online Resources

Recent studies have started to track teachers' use of online resources. Sawyer et al. (2020) found that elementary teachers, regardless of years of experience, were turning to online mathematics resources weekly; 89% reported using Teachers Pay Teachers (TPT) and 74% reported using Pinterest. The limited research literature on teachers' uses of sites such as TPT and Pinterest suggests substantial disagreement about the benefits and limitations of teachers

sharing, choosing, and using teacher-created curricular materials from these sites. For example, some research (Shelton & Archambault, 2019; Torphy et al., 2020) highlighted the positive aspects of networks of sharing across teachers without the need to involve administrators and publishers, as well as teachers' capacity to curate the wide range of materials available on these sites and to have immediate access to the materials in order to be maximally responsive to their students' needs. Other research, however, has focused more on the limitations of the activities available on TPT and Pinterest, including the predominantly low levels of cognitive demand of the tasks shared on these sites and the tendency of both sellers and buyers to choose fun, colorful activities (Sawyer et al., 2019). Most existing work concludes with the need for further research to understand how and why teachers are sharing and using teacher-created curricular materials.

Methods

We utilized the services of MDR to assist us with survey design, administration, and analysis. MDR administered the survey in September 2020. In the survey, teachers were asked about their curriculum before the pandemic, during remote teaching in Spring 2020, and their plans for Fall 2020. In the survey, we defined "Mathematics Curriculum Materials" as any materials used by teachers for the purposes of planning, teaching, and/or assessment. We asked teachers questions about the mathematics curricular materials they used in September 2019-February 2020, March 2020-June 2020, and September 2020-December 2020. In addition to the specific curricular options we provided, respondents could also select "I designed my own materials," "Other (please specify)" or "None of the above." Once the curricular materials used were established during each time frame, we asked questions about changes in curriculum reported.

We received survey responses from 524 third, fourth, and fifth grade teachers from across the U.S. Most taught in public schools (90%) located in suburban (54%), urban (28%), and rural districts (17%). The majority of the teachers we surveyed (62%) work in schools with at least half of the students eligible for *free or reduced lunch* (FRL), and many (43%) of the teachers work in schools with at least 75% of the students eligible for FRL. We distinguish between four categories: high FRL level (75%-100% of students qualify), medium-high (50%-74%), medium (15%-49%), and low (0%-14%). Descriptive frequency data for the full sample and for groups based on school FRL levels are reported. In addition, we examined and coded responses to the open-ended questions to further understand the reasons for teachers turning away supplemental and core curricula in the context of COVID-19.

Findings

Teacher Autonomy

We asked teachers how much control they had over curricular decisions during the pandemic. Teachers reported that curricular decisions were primarily made by district leaders (60%), principals (41%), grade-level teams (39%), and school boards (17%), with few teachers reporting that they were completely in control of their curricular decisions (11%).

Teachers from rural, suburban, and urban communities reported a range of control over their curriculum. For example, 16% of rural, 19% of suburban, and 29% of urban teachers reported they had no control over their curriculum. At the other end of the spectrum, 13% of rural, 12% of suburban, and 7% of urban teachers reported they had full control over their curricular decisions. Most teachers reported either "a bit" (35% rural, 40% suburban, 42% of urban) or "a lot" of control (35% rural, 29% suburban, 23% urban).

Shifts Away from Published Core Curriculum

Less than half of teachers (41%) surveyed were using at least one core curriculum prior to the pandemic; this dropped to 37% in Spring 2020 and Fall 2020. The most popular core curricula were Envision Math, Engage NY/Eureka, and Go Math. Many teachers used TPT, Pinterest, and other online teacher-created resources. TPT was the most widely used curricular resource by teachers before and during the pandemic, reportedly used by nearly half of surveyed teachers. Other online curricular supplements such as BrainPOP and IXL were used by approximately one-fourth of the teachers, decreasing slightly in their use during the pandemic.

Interestingly, at the onset of the pandemic, the frequency with which teachers designed their own materials increased. Before the pandemic, 27% of teachers designed their own materials. This increased to 35% in the Spring and 32% in the Fall. We were not surprised by this finding considering that most existing curricular materials were created for in-person contexts.

Digging Deeper into TPT Usage

TPT was the most popular curricular resource across community and economic contexts. As seen in Table 1, in rural and urban settings, the data show a linear relationship between use of TPT and economic status of students they were serving, with more teachers using TPT as the percentage of students receiving FRL increases. Around a quarter of teachers used this resource in suburban settings, regardless of the economic status of students. We have not yet been able to account for the difference in use of TPT across suburban and urban/rural contexts. These patterns do not correlate with core curricula or patterns of teacher autonomy across community contexts.

Table 1: Location and FRL Status of Teachers Using TPT prior to COVID

FRL	Pre-Pandemic				Early Pandemic (Spring 2020)				During Pandemic (Fall 2020)			
	Low	Med	MH	Hig h	Low	Med	MH	Hig h	Low	Med	MH	Hig h
Rural	2%	8%	30%	60%	0%	7%	32%	57%	2%	11%	32%	52%
Urban	7%	15%	8%	66%	6%	14%	9%	67%	6%	15%	10%	64%
Subur b	24%	26%	20%	24%	25%	26%	19%	25%	26%	26%	21%	22%

Interestingly, the use of TPT and Pinterest did not neatly match teachers' reports about their curricular autonomy; in fact, 57% of teachers who reported "a bit" or no curricular control used these resources compared to only 43% of those reporting "a lot" or complete control who reported no control over curricular decisions. It may be that teachers were turning to TPT and Pinterest to supplement their mandated curriculum while those with more control over their curriculum were more satisfied with curriculum from educational publishers.

Teachers' Reasons for Turning Away from Online, Supplemental, and Core Curriculum

We also asked teachers to explain the reasons they stopped using online teacher-created curricula (i.e., TPT, Pinterest), supplemental curricula (i.e., IXL, BrainPop) and core curricula (e.g., Go Math, Envision Math, and Engage NY/Eureka). Teachers' reasons for stopping supplemental curriculum include: there was not enough class time to use supplements, there was not enough time for the teacher to find material, their school used specific curriculum/had enough resources, the resources were not available in electronic or easy to use online format, the teachers did not want to spend the money on resources, their district did not allow use of these resources during remote learning, teachers wanted to limit resources children needed to manage

at home, students did not have access to sufficient technology at home/or the resources were not easy for all students to access, the supplemented did not meet the content needs, the resources were not offered by the school anymore, it was not rigorous enough, and they would rather use their own materials or other curricula.

When teachers were asked about the reasons they stopped using core curricula, they explained that they stopped using these resources because they only used physical book version and did not have textbooks at home, the core curriculum was not digital learner friendly, the district got rid of it/switched curriculum, they wanted to limit online platforms to make things easier for kids/parents, there was lack of rigor/declining test scores, and they would rather use their own materials.

Table 2: Reasons for Turning Away from Curriculum

Reasons	Teacher	Supplement	Core
Not enough class time	X	X	
School/district provided curricular resources	X	X	
Materials were in print form/could not be used remotely.	X	X	X
Cost/end of school subscription	X	X	
Needed to limit resources	X	X	X
Not enough time to find material	X		
Materials did not meet the instructional needs		X	X

Discussion

These data point to a novel, potentially pandemic-related trend towards teachers needing to design their own curriculum: teachers were making more of their own materials in contrast to a previously reported general trend toward more online supplemental and teacher-created materials (e.g., Sawyer et al., 2020). Rather than looking online for materials created by other teachers, teachers were inventing their own materials, not to sell, but rather because what they had available was not meeting students' needs during online/remote instruction.

Before the pandemic, our research goals were to learn more about how the curricular landscape had changed as a result of the internet and CCSSM. So many of the changes imposed upon classrooms require that teachers take up the heavy lift of managing the implementation and impact of the change. For CCSSM, teachers became the front-line workers, pulling together new curricula because their classrooms lacked the necessary resources to match the new standards (Pittard, 2017). While principals and others provided important support, the slow pace of infusion of new published curricula meant that teachers were necessarily the ultimate bridge between school shifts and children.

This was just as true during the pandemic. As the pandemic hit and teaching and learning entered entirely new territory, teachers were the ones who were in the best position to keep students learning (and feeling connected to something stable) during the new and changing notion of schooling. The existing curricular resources, including those available online, were not adequately attuned to students' new realities and needs, realities and needs that were best understood by the teachers who were connecting online with students and their families. As a result, teachers found increasing needs to create their own materials.

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