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PUBLIC COMMON-SENSE ASSUMPTIONS ABOUT MATHEMATICS

RACING IN A MA(TH)RATHON

SUPOSIÇÕES PÚBLICAS DE SENSO COMUM SOBRE MATEMÁTICA

Correr em uma maratona/matemática

SUPUESTOS DE SENTIDO COMÚN DEL PÚBLICO SOBRE MATEMÁTICAS

Correr una maratón/matemáticas

Jasmine Y. Ma
(New York University, United States)
j.ma@nyu.edu

Arundhati Velamur
(New York University, United States)
aav268@nyu.edu

Nurdan Turan
(New York University, United States)
nt2124@nyu.edu

Ali R. Blake
(Boston College, United States)
blakeae@bc.edu

Lauren Vogelstein
(New York University, United States)
lev226@nyu.edu

Molly L. Kelton
(Washington State University, United States)
molly.kelton@wsu.edu

Wendy Barrales
(New York University, United States)
wbarrales@nyu.edu

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RESUMO

A circulação de discursos públicos sobre matemática e aprendizagem da matemática moldam a forma como as famílias e os estudantes fazem sentido das suas experiências com a escolaridade. Nos Estados Unidos, estes discursos podem desempenhar um grande papel na forma como a política de educação pública é desenvolvida devido ao empenho dos conselhos escolares públicos em ouvir as vozes da comunidade, bem como a um recente (mas não novo) aumento na organização de grupos de pais conservadores bem financiados que trabalham para manter - e exacerbar - as oportunidades educativas injustas que persistem neste país. Neste artigo analisamos o discurso público em torno da aprendizagem da matemática numa reunião do conselho escolar local da cidade de Nova Iorque. Utilizando ferramentas de análise de interação, examinamos o discurso em torno de uma proposta de reintrodução de uma triagem baseada em testes para as admissões no ensino médio. Delineámos duas características-chave dos pressupostos de "senso comum" em torno da aprendizagem da matemática que circularam nesta reunião - os alunos de matemática permanecem numa trajetória de aprendizagem unidimensional, e com taxas de avanço variáveis - e investigámos como estes pressupostos se desenrolaram na construção de um mundo figurativo de "matemática escolarizada". Argumentamos que as consequências que decorrem necessariamente destes pressupostos de senso comum constroem a matemática como hierárquica e fixa, colocando os alunos numa trajetória de aprendizagem unidimensional. Finalmente, localizamos este conjunto de pressupostos emergentes no projeto racial neoliberal e consideramos as formas como eles moldam uma imaginação particular da escolaridade e da matemática sob o neoliberalismo.

Palavras-chave: educação matemática. aprendizado de matemática. discursos.

ABSTRACT

Circulating public discourses about mathematics and mathematics learning shape how families and students make sense of their experiences with schooling. In the United States, these discourses can play a large role in how public education policy is developed due to the commitment of public-school boards to hearing community voices as well as a recent (but not new) increase in the organization of well-funded conservative parent groups working to maintain–and exacerbate–the inequitable educational opportunities that persist in this country. In this paper we analyze public discourse around mathematics learning in one New York City local school board meeting. Using tools from interaction analysis, we examined the discourse surrounding a proposal to reinstate test-based screening for middle school admissions. We delineated two key features of “common-sense” assumptions around mathematics learning that circulated in this meeting–math learners stay on a one-dimensional learning trajectory, and with varying rates of advancement–and investigated how these assumptions played out in the construction of a figured world of “schooled mathematics.” We argue that the consequences that necessarily follow from these common-sense assumptions construct mathematics as hierarchical and fixed, placing learners on a one-dimensional learning trajectory. Finally, we locate this set of emergent assumptions in the neoliberal racial project and consider the ways in which they shape a particular imagination of schooling and mathematics under neoliberalism.

Keywords: mathematics education. mathematics learning. discourses.

RESUMEM

Los discursos públicos que circulan sobre las matemáticas y su aprendizaje determinan el modo en que las familias y los alumnos dan sentido a sus experiencias escolares. En Estados

Unidos, estos discursos pueden desempeñar un papel importante en el desarrollo de la política educativa pública debido al compromiso de los consejos escolares públicos de escuchar las voces de la comunidad, así como al reciente (aunque no nuevo) aumento de la organización de grupos de padres conservadores bien financiados que trabajan para mantener -y exacerbar- la desigualdad de oportunidades educativas que persiste en este país. En este trabajo analizamos el discurso público en torno al aprendizaje de las matemáticas en una reunión del consejo escolar local de la ciudad de Nueva York. Utilizando herramientas de análisis de la interacción, examinamos el discurso en torno a una propuesta para restablecer la selección basada en exámenes para la admisión en la escuela secundaria. Delineamos dos características clave de los supuestos de "sentido común" en torno al aprendizaje de las matemáticas que circularon en esta reunión -los estudiantes de matemáticas permanecen en una trayectoria de aprendizaje unidimensional, y con diferentes tasas de avance- e investigamos cómo estos supuestos jugaron en la construcción de un mundo figurado de "matemáticas escolarizadas". Argumentamos que las consecuencias que se derivan necesariamente de estos supuestos de sentido común construyen las matemáticas como jerárquicas y fijas, situando a los alumnos en una trayectoria de aprendizaje unidimensional. Por último, situamos este conjunto de supuestos emergentes en el proyecto racial neoliberal y consideramos las formas en que configuran una imaginación particular de la escolarización y las matemáticas bajo el neoliberalismo.

Palabras clave: educación matemática. aprendizaje de las matemáticas. discursos.

Introduction

What we understand mathematics to be is intimately interrelated with how we understand who can do mathematics and who cannot (Jackson, 2009), what mathematics learning looks like and how it works (Boaler & Greeno, 2000), and ultimately who has access to mathematics and mathematics learning (Gutiérrez, 2019). In other words, it is important to consider how a variety of aspects of teaching and learning mathematics are socially constructed. In this paper, we consider how ideas that circulate about mathematics and mathematics learning influence families' sense-making around their children's experiences in schools and consequently, how they respond. In this case, some families sought a public platform to either support or oppose recommendations around public middle school enrollment policy and tracking, often using mathematics as an important part of their rationale. We analyze how members of the New York City (NYC) public and a local school board–a group of appointed and elected community members responsible for representing the community's educational needs and shaping local policy–constructed mathematics learning, and how this construction had consequences for the arguments they made around differentiation and middle school enrollment.

In the US, conservatives are mobilizing to influence public education at multiple levels, from local school boards to state-level legislation (Stanford, 2022). Through these efforts, groups aim to significantly restrict schools and teachers' curricular decision-making in favor of a supposed neutral (read: dominant, supremacist) position; ultimately such efforts direct resources away from and aim to erode public education. In these conditions, the yet-to-be-realized potential of public education for liberation is under significant threat. Public education forums are one significant arena where the public engages in this struggle. In making a case for a plethora of concerns, needs, and resolutions, Council members and public meeting participants mobilize liberatory, social mobility, meritocratic–and more–orientations toward what purpose(s) schools serve and for whom. The discipline of mathematics is implicated in these various constructions in many ways: throughout its history and through the consolidation of power within it–via the construction and funding of STEM (Science, Technology, Engineering, and Mathematics)–STEM education in the U.S. is rooted in (imperial) competitiveness and militarism (see: Vossoughi & Vakil, 2018). While the seeds of U.S. STEM education–and mathematics education specifically–are sown in increasing efforts at conquest, those tasked with supporting mathematics education (including teachers, administrators, and families) approach that task from many

positions. 'Common-sense' assumptions about mathematics learning animate those positions toward multiple visions of schools and societies, seeding the construction of many aspects of a figured world of mathematics education.

New York City's Community Education Councils

In NYC, local school boards for elementary and middle schools are organized by school districts, which are geographical zones within the city. These local school boards are called Community Education Councils (CECs), and are composed of 12 voting members, 10 of whom are elected, and 2 appointed. Each CEC is "charged with promoting student achievement, advising and commenting on educational policies, and providing input" (Community and Citywide Education Councils, n.d.) to the leadership in the city's Department of Education (DoE). Each month the CEC of each district has a meeting where resolutions are discussed and voted on. Members of the public are invited to sign up in advance and speak for two minutes on any proposed resolution or other ongoing issue. It is expected that Council members take into account the opinion of the public. Resolutions are written by Council members and may be approved by a majority vote by a Council. These resolutions serve as recommendations (not as mandates) to the superintendent of the district and the city's DoE.

Our analysis focuses on one public meeting of a CEC in November 2021. This CEC was the Council of a large NYC district in which most of the city's most desirable (i.e., well-resourced and known for high achievement) schools were located. NYC's public schools have a complicated history of zoning and choice that have maintained school segregation (e.g., Bonastia, 2022). Before the COVID-19 pandemic shut school buildings down in March 2020, most of the city's middle schools had been enrolled through "screened admissions"—in other words, at the end of elementary school in the 5th grade, public school students had to apply to middle school (6th-8th grade) with information such as attendance data, essays, grades, and standardized test scores in English Language Arts and Mathematics from their 4th grade year. Schools admitted students using different criteria, including taking only students with the highest scores; looking at attendance records, admissions essays and interviews; using a random selection process; or different permutations of these. Students were matched based on admissions criteria in coordination with their top choices, which could include 12 schools ordered by preference. Due to the complications related to attendance and testing in March 2020, NYC middle school admissions converted completely to a random selection process for students starting middle school in September 2021 (these students would have been in the 4th grade in March 2020).

In October 2021, the NYC DoE announced that the next admissions cycle (for students starting middle school in Fall 2022) would rely on random selection as well. As a consequence, some members of this CEC authored Resolution 182, which, among other things, (1) "demand[ed] that principals and school leadership teams of district middle schools be allowed to determine whether to bring back academic screening," (2) asked for more advanced and accelerated curriculum to be offered, and (3) asked for classes to be rearranged to track students "so that the curriculum provided to each student can match student's [sic] proficiency level and appropriate learning pace." During the meeting, public audience members as well as Council members spoke in support of and opposition to this resolution. For our analysis, we asked: *How was mathematics learning constructed by speakers, and with what consequences for their arguments?*

Theoretical Framework

We began with the idea of "common-sense" assumptions that circulate in public discourse. These ideas are routinely used and easily agreed upon in everyday life. Individuals rely on these shared understandings to maintain social order in everyday interactions. These assumptions are, of course, culturally and historically constructed, rather than universal truths (Schutz, 1953). What's more, "Not only does common sense knowledge portray a real society for members, but in the manner of a self fulfilling prophecy the features of the real society are produced by persons' motivated compliance with

these background expectancies. … Seen from the person's point of view, his commitments to motivated compliance consist of his grasp of and subscription to the 'natural facts of life in society'" (Garfinkel, 1967; p. 53). As Ma and colleagues (2021) have argued previously, "It follows that the common-sense understandings on which the inequitable conditions of mathematics education have been built serve to reproduce these conditions" (p. 105).

We then framed our analysis around Holland et al.'s (1998) concept of figured worlds, a "socially and culturally constructed realm of interpretation in which particular actors and characters are recognized, significance is assigned to certain acts, and particular outcomes are valued over others" (p. 52). This "realm of interpretation" that constituted school mathematics learning is shared–and (re)produced–by the majority of participants in the meeting, and reflected in their arguments during the meeting. What sorts of outcomes, for example, were valued in mathematics education as figured in and through discourse? What kinds of meanings and significance did different acts take on, and toward what ends? More generally, we were interested in common-sense assumptions about teaching and learning mathematics that were surfaced as participants navigated and constructed the figured world of mathematics education. Then through these common-sense assumptions our analysis re-constructed that figured world of mathematics education in which meeting participants were operating.

For Holland et al. (1998), figured worlds are lived through practices and activities that are articulated against a backdrop of larger systems of power and privilege. We bring this perspective to think about the sociopolitical consequences of the figured world of mathematics education and the material, day-to-day activities that realize these consequences. We approached and mobilized these theories as lenses from various social positions that guided our theoretical and methodological commitments. As researchers working within the context of US schooling, we are committed to conducting analyses that situate mathematics and schooling as particular social institutions and sociohistorical objects (Bishop, 1990; D'Ambrosio, 1985) by building on foundational work in mathematics education (e.g., Boaler & Greeno, 2000), learning sciences (e.g., Horn, 2007), and critical perspectives in mathematics education (e.g., Gutiérrez, 2019). Thus, we did not necessarily ascribe to the common-sense assumptions about school mathematics described in our findings and we did not take current instantiations of schooling and mathematics as the only possibilities for public education. We hoped to support re-constructing school mathematics towards more just ends for youth as both scholars and members of our local communities. Particularly, the first author is a mother of two children in public schools in this district and engaged as a parent in these meetings through Parent Teacher Association and School Leadership Team (SLT) activities (although she did not speak at the meeting analyzed in this paper). Her participation in these meetings along with the groups' commitments to conducting expansive analyses of (mathematics) learning and the potential of public education led to this study.

Methods

This analysis was part of a larger study investigating discourses of public engagement in education, following the public meetings of this CEC for the 2-year term of these Council members, from Fall 2021 through Summer 2023. The election of this Council marked the second term where a large proportion of this district's CEC was composed of conservative members whose timeline and commitments reflect those of monied groups that have been responsible for legislation in the US funneling public funds to privately run schools and banning curricula that mention LGBTQ issues and race.

For this analysis we selected the meeting on November 9, 2021, in which assumptions about how students learn mathematics was prevalent given the focus on Resolution 182. While Resolution 182 was presumably about all subject areas, mathematics was commonly raised as an example or as a proxy for academic ability (Gutiérrez, 2008). While mathematics was mentioned in other meetings in our corpus, we did not intend to be comprehensive in discovering the ways in which mathematics learning may be constructed in the context of public engagement around education. Instead, our analysis revealed how numerous speakers addressing the particular topic of Resolution 182 constructed mathematics learning in a way that foreclosed possibilities for their arguments.

Our analysis began with group viewings of the video of the CEC meeting by co-authors as well as other members of our research team. The CEC meeting was held remotely using Zoom software and live-streamed on Youtube. We had access only to the Zoom recording, distributed publicly by the CEC. In this recording only those with their video cameras turned on were visible. Most public audience members kept their video cameras turned off except when speaking. The CEC Council members present kept their video cameras turned on, as did the district superintendent, who, along with Council members, was required to be present at all monthly meetings. Group viewings used a modified version of Jordan & Henderson's (1995) group viewing protocol where video is stopped when a participant sees something they want to comment on. Early viewings resisted predetermined analytic categories to the extent possible, though it was agreed upon that mathematics was of interest. As themes emerged from these early viewings, we selected for close analysis speaker turns that either mentioned mathematics, explicitly referenced another turn that mentioned mathematics, or picked up an idea or argument that was put into relation with mathematics in an earlier turn. In total, this resulted in 12 speaking turns, seven in support of the resolution and five opposed to it. Three of the speakers in support of the resolution were Council members.

Once this subset of speaker turns were selected, they were analyzed according to the themes that had emerged earlier: common sense assumptions about mathematics learning, how students were characterized in relation to mathematics and learning, how students were positioned in relation to each other, the work of teaching, and the role/responsibility of public schooling. In short, analysis worked to illustrate the figured world of mathematics learning as it took shape through discussions in the CEC meeting. While the participation structure (Erickson & Shultz, 1997), or interactional organization of these meetings were not typical of the kinds of conversations from which interaction analysis developed, we followed the commitment of this methodology in holding ourselves accountable to participants' sense-making, following ideas toward which participants mutually oriented, and interrogating how they assembled these ideas to accomplish their arguments (Jordan & Henderson, 1995).

A common sense of mathematics learning

The speakers throughout the meeting relied on a common sense assumption of mathematics learning using speed and position metaphors. This is not a surprise given common language used across NYC DoE and nationally. For example, many schools in the city offered "accelerated" or "advanced" courses in mathematics. Nationally, the No Child Left Behind Act of 2001, in effect until 2015, sought to raise the performance of "lower performing" students across the country, with a focus on language arts and mathematics. In the CEC meeting, speakers supporting Resolution 182 consistently described students that "fell behind" during remote learning due to COVID-19 school building shutdowns; students that were "below" or "above grade level," "low" and "high achievers" or "ability," "advanced work," students being "at different places" and the need to "meet them where they are." Of note is the one-dimensionality of these possible positionings. Not only do they necessarily rank students (it is clear that some positions—behind, low—are less desirable than others—above, high) but they are along a one dimensional spectrum. There are no possibilities beyond being worse than, better than, or on target. Of course, these characterizations of mathematics learning are inaccurate. There are not only many ways to be smart or successful in mathematics (Horn, 2012), but what counts as smartness depends on constructions of mathematics and the learning environment (Gresalfi et al., 2009). Further, this one-dimensionality can be quite damaging, as these characterizations serve to limit what "low achieving" students have access to while simultaneously enhancing the opportunities to learn for those labeled as "high achievers"—exactly what this resolution is recommending.

The position metaphor aligns neatly with the rate metaphors rampant in these speakers' arguments, referencing students as "moving slowly," "needing a faster pace," or "being accelerated." One parent even reported her 6th grade son telling her, "Mom. I feel like I'm ready to run a marathon. And my school is teaching me how to crawl." This common sense assumption about mathematics learning uses the rate metaphor in coordination with the one-dimensional position metaphor, thereby not only sorting

students along a scale of less to more able, but also implying that students shape each others' learning (e.g., slow students slow down fast students).

Constructing a figured world of schooled mathematics

This one-dimensional, rate metaphor common sense assumption of mathematics learning can be seen as a building block for a figured world of schooling and mathematics education, one that ostensibly supported all students, but was primarily concerned with individual achievement. First, the rate metaphor *precluded any shifting* in position for the "slow" students, or in speed for "accelerated" students. The former blocked progress (and "acceleration") for others, while the latter had to "slow down" due to a "slow-paced" and "dumbed-down" curriculum. Even speakers in opposition to the resolution described only students who "learn in different ways" and can "live up to" their potential at "different levels in different subjects" (as opposed to, for example, students who have different kinds of smartnesses, or are fast sometimes and slow at other times in math). These rate metaphors were durable for students within a subject—"fast" math learners will always be fast, regardless of instruction or institutional context or life circumstance or particular math content, while "slow" math learners will always be slow. In this figured world, the learning identities of students were static.

Second, because the common sense assumption was that mathematics learning occurs on only a one-dimensional path, it follows that in this figured world, *learning is acquisition (Sfard, 1998), and mathematics is sequential (Horn, 2007)*. In other words, mathematics was treated as a set of knowledge to be acquired, with a certain subset designated for each grade level. The knowledge at each grade level is a prerequisite for learning the knowledge of the subsequent grade level. Students with "higher ability" were "accelerated," able to acquire more content faster, and therefore be "higher achievers" and be "above grade level." This is in contrast to what Sfard described as a participationist way of understanding learning, where students' participation in a community of practice is the indicator for learning (as opposed to how much knowledge is acquired). In a participationist metaphor for learning, a variety of practices are at stake. This is also in contrast with a connected (rather than sequential) view of mathematics; learners have access to more "advanced" mathematical concepts with a range of prior knowledge (e.g., Kaput, 2008). With this one-dimensional, acquisitionist, sequential view of mathematics learning, it is reasonable to expect that students of differing "ability" or "achievement" levels cannot learn together. In fact, like objects lined up in a narrow tube, the "slowest" students stop up the flow of everyone else's progress. Because teachers must teach content for the "low ability" students—content that the "fast," "high achievers" already have, there is nothing for these "advanced" students to do but wait, bored and frustrated. As Horn (2007) writes, "The sequential view of mathematics needs to be taken on, and with it, a more adequate technical language to represent the complexity of student learning" (p. 75).

Third, while the resolution asked for both the reinstatement of screens and improved differentiation and tracking, most speakers argued that differentiation would be impossible given the wide range of "student abilities" or "grade levels" in one classroom, and therefore tracking was the only short term solution and the return of academic screens the inevitable long term solution. Interestingly, in the figured world that was constructed by supporters of the resolution, *differentiation constituted tailoring content or curriculum to particular students*, rather than tailoring teaching, the more common educational use of the term differentiation (Sparks, 2015). For example, one speaker spoke of advocating for "a differentiated opportunity" for his daughter, calling it an "accommodation" that "is not a regular part of what the school is offering." Then, he argued that "Schools are not differentiating for the kids that are even at or above grade level because it appears in math that they are doing 4th or 5th grade level work right now." In both of these statements this parent was equating differentiation to an "offering" and specific "grade level work;" it is clear that he was arguing students needed alternative content, rather than teaching that addressed a range of prior knowledge, interests, and learning needs. In fact, given the common sense assumptions of mathematics learning as one-dimensional, anchoring this figured world

where a child's rate of learning is innate and durable, how teachers teach content is much less relevant than what content they have to offer.

Finally, across these elements of this figured world, schools were also constructed as having particular meanings and purposes. As individual children's grade levels and abilities were centered, so then in this figured world *schools were responsible for maintaining and advancing individual students' grade levels*. One parent went so far as to say, "As a parent with a gifted child, it's very heartbreaking to see that he's not learning and not enjoying school at all and not getting the benefits of what District 2 should be offering to our child and our needs." The school district owed to this child "learning" and "enjoyment," and serving the family's "needs;" these were the "benefits" that the district "should be offering." The point here is not that learning and enjoyment should not be a part of what schools offer. However, our concern is that the figured world constructed here, which places these responsibilities of schooling in relation with fast and slow kids, mathematics as sequential, and differentiation as modifying content, elides other important purposes of schooling, as described below.

Discussion

In her analysis of school board hearings about the closure of schools on the south side of Chicago, Ewing (2018) characterized the opposing ways in which people interpreted the role of schooling as "dueling realities." School board officials in Ewing's study often resorted to test scores and other numerical data to justify the decision to close schools, whereas community members consistently brought up the role of the schools in fostering community and Black culture in the neighborhood as they urged for the schools to remain open. Writing about the comments of one community member, Ewing noted that he "challenges a version of events that acts as if history never happened—as if the timeline of everything we need to know somehow begins with 2011 test scores" (Ewing, 2018, p.108). Community members in Ewing's study construct a vision of schooling that is in stark contrast to the figured world of speakers at the CEC meeting. If the former group imagines the school as a place in which (Black) history, culture, and community unfold and are kept alive, CEC speakers constructed it as a place designed to serve exclusive individual interests. Indeed, even the comments of those opposed to resolution 182 were premised on the same common sense assumptions about mathematics and learning that those who spoke in favor of it operated from. In her comments against the resolution, one speaker noted that her child was (using air-quotes) a "high achiever," that the standards of schooling were "in *some ways* [emphasis added] arbitrary," that "in *some cases* [emphasis added] GPA and grades do not predict academic success, intelligence, life success," and that there were other ways to address concerns surrounding "individualized attention." Although these comments alluded to an alternative imaginary of schooling (e.g., "we need to keep our schools open and available to everyone"), the speaker's words nevertheless suggested a picture of formal education in which test scores do matter and individualized learning remains a focus. More generally, participants opposed to the resolution did not unsettle the arguments in favor of the resolution, but instead brought in adjacent perspectives on how a policy like resolution 182 was racist and worked against diversity.

Participants in the CEC meeting figured a world of mathematics and schooling in alignment with the neoliberal racial project (Chen & Buell, 2018). Marked by an emphasis on individuality and competitiveness, the neoliberal racial project structures a construction of mathematics learning that justifies and rationalizes the concentration of (mathematics) educational resources in communities that already enjoy economic and social power and away from marginalized groups, perpetuating racist ideologies. The influence of neoliberalism in shaping imaginaries around schooling and mathematics is far reaching, so that even those who offer alternative ideas for what schools could be—such as the speakers opposed to resolution 182—find themselves bound to the emphasis on the individual at the expense of community. This focus on the individual has also served to characterize teachers' conceptualizations of student learning, guiding the kinds of pedagogical responses teachers make in hopes of supporting learning (Horn, 2007). We contend that for mathematics education to improve and serve all learners, we need to disentangle the assumptions that guide policy from neoliberal agendas, and

work towards a vision of mathematics learning that includes and humanizes all learners (Gutiérrez, 2018).

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