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INSTITUTIONAL AND INSTRUCTIONAL DECOLONIZING MATHEMATICS EDUCATION

DESCOLONIZACIÓN INSTITUCIONAL E INSTRUCTIVA DE LA EDUCACIÓN MATEMÁTICA

DESCOLONIZAÇÃO INSTITUCIONAL E INSTRUCIONAL DA EDUCAÇÃO MATEMÁTICA

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ABSTRACT

In this theoretical essay, we respond to recent scholarship on decolonizing mathematics that asserts that so-called "Western" mathematics is inherently colonialist – that is, in service of the economic and political control of European or wealthy nations over countries of the Global South. Although generally sympathetic with that literature, we argue against some of its presumptions, in part, by distinguishing "Western" or academic mathematics from its recontextualization for schools. First, we argue that, although colonialist messages and values can be disseminated as part of that recontextualization, it is not clear that academic mathematics is inherently colonialist. Then, we offer a suggestive insight into what it might mean to decolonize school mathematics through a pedagogical approach based on research on native language learning, called the "subordination of teaching to learning." The approach uses tasks that invite learners to use their indigenous mental powers (or brilliance) through engaging in dialogic interactions with themselves and others about objects and relations among them. To illustrate the subordination of teaching to learning, we present an example of how learners use their learning powers to educate their awareness and build mathematical ideas and reasoning; thereby experiencing the joy of their intellectual efforts.

Keywords: curricular recontextualization. indigenous mental powers. mathematical awareness. subordination of teaching to learning.

RESUMEN

En este ensayo teórico, reconocemos los nuevos estudios sobre la descolonización de las matemáticas que afirma que la llamada matemática "occidental" es inherentemente colonialista – es decir, en servicio para el control económico y político de naciones europeas o adineradas sobre los países del Sur Global. Aunque simpatizamos generalmente con la literatura, argumentamos en contra de algunas de sus presunciones, en parte, distinguiendo las matemáticas "occidentales" o académicas de su recontextualización para las escuelas. Primero, argumentamos que, aunque los mensajes y valores colonialistas pueden ser difundidos como parte de la recontextualización, no es claro si las matemáticas académicas son inherentemente colonialistas. Luego, ofrecemos una visión sugestiva de lo que posiblemente signifique la descolonización de las matemáticas escolares por medio de un método pedagógico basado en la investigación del aprendizaje de lenguas nativas, llamado la "subordinación de la enseñanza al aprendizaje." Este método utiliza actividades que invitan a los estudiantes a usar sus poderes mentales indígenas (o agudos) a través de la participación en interacciones dialógicas consigo mismo y con otras/os sobre los sobjectos y la relaciones entre ellos. Para ilustrar la subordinación de la enseñanza al aprendizaje, les presentaremos un ejemplo de cómo los estudiantes usan sus poderes de aprendizaje para educar su conciencia y construir ideas y razonamiento matemático; experimentando así la alegría de sus esfuerzos intelectuales

Palabras clave: recontextualización curricular. facultades mentales indígenas. conciencia matemática. subordinación de la enseñanza al aprendizaje.

RESUMO

Neste ensaio teórico, respondemos aos recentes estudos sobre a descolonização da matemática que afirmam que a chamada matemática "ocidental" é inerentemente colonialista, ou seja, está a serviço do controle econômico e político das nações europeias ou ricas sobre os países do Sul Global. Embora, em geral, simpatizemos com essa literatura, argumentamos contra algumas de suas pressuposições, em parte, distinguindo a matemática "ocidental" ou acadêmica de sua recontextualização para as escolas. Primeiro, argumentamos que, embora mensagens e valores colonialistas possam ser disseminados como parte dessa recontextualização, não está claro que a matemática acadêmica seja inerentemente colonialista. Em seguida, oferecemos uma visão sugestiva do que pode significar descolonizar a matemática escolar por meio de uma abordagem pedagógica baseada em pesquisas sobre o aprendizado de idiomas nativos, chamada de "subordinação do ensino à aprendizagem". A abordagem utiliza tarefas que convidam os alunos a usar seus poderes mentais indígenas (ou brilhantismo) por meio de interações dialógicas com eles mesmos e com os outros sobre objetos e relações entre eles. Para ilustrar a subordinação do ensino à aprendizagem, apresentamos um exemplo de como os alunos usam seus poderes de aprendizagem para educar sua consciência e desenvolver ideias e raciocínios matemáticos, experimentando assim a alegria de seus esforços intelectuais.

Palavras-chave: recontextualização curricular. poderes mentais indígenas. consciência matemática. subordinação do ensino ao aprendizado.

Introduction

Calls to decolonize educational systems and curricula have increased in recent years. More attention has been paid to decolonizing university than K-12 education, particularly certain subjects (e.g., the humanities and social sciences). At all levels of education, as Foster et al. (2022) observe, "less attention has been given to STEM subjects generally, and mathematics in particular" (p. 9). Although there are earlier examples (e.g., Iseke-Barnes, 2000), several recent publications (e.g., Foster et al., 2022; Fernandes, 2021; Greene & Mukhopadhyay, 2017) indicate an increased interest in decolonizing mathematics and mathematics education. Though scholarship in this area is nascent and there is no consensus, there are shared presuppositions and views on what decolonizing would entail. We consider and critique two of those in this introductory section before presenting our 'alternative' view.

First, scholars publishing in this space believe the ideas and techniques of so-called "Western mathematics" are inherently colonialist, that is, furthering the political control of European or wealthy nations over non-European or less wealthy nations (Foster et al., 2022; Fernandes, 2021; Iseke-Barnes, 2000). In part, their argument is rather than a sociohistorical construct, "Western mathematics" presents itself as dealing in timeless, universal, robust, and infallible "truths" and, as such, as superior to other ways of knowing (quantitatively) inclusive of so-called "non-Western mathematics" or ethnomathematics. Greene and Mukhopadhyay (2017) assert that mathematics "has been narrowed to a Eurocentric perspective" and "has fully been colonized and a single system of categorizing, describing, and creating knowledge and reality accepted" (p. 65).

Although we share the view that "Western mathematics" is a social construct and culturally arbitrary, we argue, rather than the subject itself, mathematicians, mathematics educators, "Western" educational institutions (e.g., schools, publishers), and Western administrative and political elites are responsible for propagating the myth that "Western" mathematics is universal and, for that matter, the related myth that the subject currently institutionalized in university and other settings is "Western." Instead, we understand "Western mathematics" as a conglomerate of discursive, symbolic, and textual practices gleaned from various historically and geographically identifiable cultures. Although often associated with Ancient Greece and Western Europe, intellectual communities in present-day Western and non-Western societies contributed to what some refer to as "Western mathematics" (Joseph, 1991). African, Arab, and Indian mathematicians developed ideas and techniques now included in "Western mathematics" before European colonialism.

Second, contributors to the decolonizing mathematics education literature assert that applications of so-called "Western mathematics" by European colonizers (and racists) prove mathematics is inherently colonialist. As evidence, they reference the development and early application of statistics. For example, Foster et al. (2022) cite Pearson's correlation coefficient (r), a measure of linear correlation between two continuous variables developed by Karl Pearson, an English statistician and eugenicist. Similarly, Fernandes (2021) and Greene and Mukhopadhyay (2017) cite craniology, the pseudo-scientific study of the relationship between human skull size and intelligence, applications of measurement with calipers, and statistics that scientific racists believed would prove Europeans' intellectual superiority. One can think of other problematic applications of mathematics and statistics, including computational models and big-data algorithms that perpetuate, if not exacerbate, institutional racism and other systemic biases by extrapolating from sociohistorical data (O'Neil, 2017).

Although those are potent examples of how mathematical, statistical, and computational tools can be used in elitist, colonial, neo-colonial, neoliberal, and racist projects, we question whether any show that "Western mathematics" concepts and techniques (e.g., correlation coefficients and calipers) are inherently colonialist or, for that matter, racist, capitalist, etc. We instead believe this is an open question. We recognize that the development of arithmetic and other aspects of "Western mathematics" was made possible by early capitalism, social inequality, and oppressive social arrangements (Swetz, 1987). When recontextualized as a school subject (see below), "dominant social and cultural forces have used "Western" mathematics to label, divide, and sort students along national, ethnic, racialized, classed, gendered, linguistic, and other lines. Nor does it mean that in no small part owing to British and U.S. colonialism, standardized, professional-class English has become the de facto language through which academic mathematics currently is produced, practiced, and disseminated. Nor does it mean that the subject is not generally taught in oppressive, dehumanizing ways. However, again, we believe distinctions must be made between academic or "Western" mathematics, how it is applied and taught.

In the remainder of this paper, we offer an alternative, *initial* take on what decolonizing school mathematics might look like. Unlike others who have contributed to the literature on decolonizing mathematics, we do not assume the concepts and tools of academic mathematics are inherently colonialist or, by their very nature, promote Western or settler colonialism. Instead, drawing on sociological theory, we first argue that to be taught in schools and university settings, academic mathematics is recontextualized and, in that process, colonist as well as anti-colonialist messages—ideas, logics, and, perhaps also, practices (e.g., furthering occupation through the creation of new settlements) —can be introduced into the curriculum. Then, drawing mainly on Gattegno's (1970/2010, 1973/2000, 1987) work, we present an anti-colonialist instructional approach that treats learners as protagonists of their learning and invites them to use their indigenous mental powers to become aware and talk about relations they of among physical and mental objects. Finally, recognizing that work in this area is nascent, we conclude by inviting other equity-oriented educators to respond to our initial thoughts about what decolonizing mathematics education might entail.

Recontextualization and Colonist Messages in Mathematics Education

To what extent is mathematics colonialist? The answer partly depends on what one means by the term mathematics. Because it is a sliding signifier, it is helpful to begin with some conceptual distinctions. To do that, we draw on the sociological theories of Bernstein (1999, 2000) and Dowling (1998), who both hold that academic fields like academic mathematics are hierarchical and self-referential. Explaining *self-referentiality*, Bernstein (2000) contends that academic disciplines have "produced a discourse which was about only themselves" and that "these discourses had very few external references other than in terms of themselves" (p. 9). Self-referential knowledge is socially constructed through symbolic abstractions that begin in concrete, everyday practices and experiences (Dowling, 1998). In mathematics, self-referentiality intensifies through constructing new abstractions from already accepted abstractions (e.g., category theory as a generalized study of mathematical structures) and developing specialized discourses to work with these abstractions.

Bernstein (1999) observes that academic disciplines have developed *vertical discourses* which "[take] the form of coherent, explicit, and systematically principled structure[s], hierarchically organised, as in the sciences" (p. 159). Vertical discourses create general propositions and theories "which integrate knowledge at lower levels, and in this way [show] underlying uniformities across an expanding range of apparently different phenomena" (p. 162). Vertical discourses are dislocated from the physical and social contexts of their creation and, as such, potentially applicable in new contexts. The vertical discourses of academic disciplines currently are articulated, to a high degree, by professional scholars in academic journals and other specialized texts and, as noted, most often in professional-class English.

Bernstein (1999) contrasts vertical discourses with horizontal discourses. *Horizontal discourses*, such as those used in manual labor like home construction and everyday practices like drumming, are generally "oral, local, context-dependent and specific, [and] tacit" (p. 159). Horizontal discourses are typically acquired outside of schools through apprenticeships and, being localized and context-dependent, do not generalize easily beyond themselves. Moreover, the relationships among different horizontal discourses are segmental in that they are not well-integrated with each other.

For our purposes, we distinguish between *institutional* and *everyday mathematics*, a distinction closely related to *vertical* and *horizontal discourses*. *Institutional mathematics* includes *academic mathematics*, the discursive practices and vertical discourses (e.g., problem statements, proofs, axioms) of professional mathematicians, and the "official" knowledge they sanction in the written texts they disseminate. *Institutional mathematics* also includes *elementary, secondary,* and *post-secondary school mathematics*, all recontextualizations of *academic mathematics* for mathematics learners. *Everyday mathematics* involves quantitative reasoning, practices (e.g., measuring, hairstyling, gaming), and horizontal discourses that people use outside school. The weak hybridity between institutional and everyday mathematics (see, for example, Lave et al., 1984) is rooted in the former's vertical, self-referential discursive practices and the latter's horizontal discourses and situated practices.

Bernstein (1999) and Dowling (1998) use the term "recontextualization" to refer to how the discursive practices and scholarly texts of academic disciplines are altered as they are dislocated from institutional (e.g., university, governmental) settings where they are practiced and regulated and relocated into schools and the discursive practices and texts used in schooling. Recontextualization entails a transformation of practice regardless of whether, like academic mathematics, it is symbol-, discourse-, or text-intensive or, like manual labor, is much less so. We note here that this would hold for the recontextualization of ethnomathematical and non-dominant ways of knowing – an issue that, we would argue, is not adequately addressed in the literature on decolonizing mathematics (e.g., Greene & Mukhopadhyay, 2017; Iseke-Barnes, 2000).

Recontextualization is shaped in response to the discursive practices of academic mathematicians but also by policymakers and administrators who set official curriculum policies, curriculum authors and administrators who translate those policies into curriculum materials, and teachers tasked with implementing those materials. Various non-disciplinary considerations, including psychological theory and assumptions about supposed learning styles and capabilities of youths from dominant and non-dominant cultural backgrounds, influence curricular recontextualizations (Bernstein, 1999; Brantlinger, 2022; Dowling, 1998). High-stakes tests and other assessments also exert an influence. Powell (2022) cites the Programme for International Student Assessment (PISA), an arm of the Organization for Economic Co-operation and Development (OECD), as a neocolonialist and neoliberal assessment project that internationally shapes school mathematics curriculum and instruction.

Colonialist and neocolonialist messages and practices can enter the mathematics curriculum through the recontextualization of academic mathematics for schools. For example, through an "informational" aside that spreads myths about the universality, timelessness, infallibility, and widespread utility of academic mathematics or through a historical aside that uncritically celebrates the mathematical contributions of certain Western European scholars like Isaac Newton without recognizing earlier contributions of the likes of the Indian scholar Madhava of Sangamagrama. It might enter through (a) curricular images of mathematicians who are solely or majority White and male; or (b) curricular contexts that promote white normative, even white supremacist, and other status quo understandings of the social world. As Powell (2022) observes, racist and sexist ideologies have shaped the historiography of mathematics, which is reflected in curricular materials. Increasing numbers of scholars have challenged Eurocentric narratives about the origins of mathematical knowledge (e.g., Gerdes & Djebbar, 2004; Joseph, 1991). However, at a fundamental level, it enters from curricula that impose others' mathematical ideas and fail to invite learners to use their mental and discursive powers to be protagonists in building mathematical ideas and reasoning and, thereby, experience the joy of their intellectual efforts.

An example of how colonialist messages, if not colonialist practices, enter school mathematics curriculum through the recontextualization of academic mathematics is *The Overland Trail*, a ninth-grade unit from the *Interactive Mathematics Program* (Fendel et al., 2000). Students, organized into small groups, are asked "to be responsible for the planning and travel of four family units on the wagon trail" (p. 193); that is, to affiliate themselves with white settler colonialist families irrespective of their ethnic or racial backgrounds or feelings about white settler colonialism. Although the unit's tone is a matter-of-fact acceptance of colonialism as a historical fact, a few asides and problem contexts open spaces for critique. Specifically, a footnote at the unit's beginning informs: "While the land was offered 'free' to these migrants, it was not land that was free for the taking. It was the home of the indigenous peoples who had been living there for thousands of years" (p. 190). The day ten homework assignment specifically informs students, "[n]o nation was safe from the ravages of smallpox, cholera, measles, scarlet fever, influenza, and tuberculosis. Those diseases, imported from Europe, took a great toll on Native Americans, bringing death, destruction, and untold misery, killing more people than warfare, slavery, or starvation" (p. 220) and further that "it has been estimated that between 1492 and 1900 the Native American population decreased by about 90%" (p. 221). However, rather than engage students in sociohistorical critique by reflecting on the violence and misery white settlers inflicted on Native Americans – and, for that matter, enslaved Africans – the text instead asks them to do school mathematics: "[u]se variables and an equation to show how you would find the population of Native Americans at the end of this time period if you knew the population of Native Americans at the beginning of this period" (p. 221).

Finally, although recontextualization can introduce colonialist ideology into school mathematics, the question remains whether academic mathematics is inherently colonialist. On the surface, vertical discourses of academic mathematics neither favor nor disfavor colonialist projects. Further, academic mathematics discourse about mathematical objects, principles, and arguments has nothing to say about (European) colonialism. However, specific underlying values or logics of academic mathematics are consistent with values or logics of European colonialism. Bishop (1990) argues that values "associated with" abstract "symbolisms" of "Western European mathematics" are, in fact, "associated with" Western European imperialism – and hence colonialism. He specifically mentions these: "objectivism" that perceives the world as consisting of "discrete objects" (p. 57), "spirit of rationality" that scorns "mere trial and error practices, traditional wisdom, and witchcraft" (p. 56), and "power and control" in which mathematics operates indirectly through science and technology (p. 58).

Furthermore, he observes that these values "must have had a tremendous impact on the indigenous cultures" they interacted with (p. 56). While, through colonialism, "Western" mathematics and value systems associated with it indeed were forced on indigenous populations, the questions are (a) whether the "values" of objectivism, rationality, and power and control are inherent to academic mathematics or, in Bishop's terms, are "associated with" it; and (b) do those values further or favor Western colonialism. We see power and control to be about the problematic ways that mathematics is applied but not essential to doing academic mathematics. At the same time, we agree that objectivism and specific rationalities are foundational to academic mathematics as the discipline deals in abstract objects and has a set of rationalities – logics or language games – that, for instance, are partially visible in mathematical proofs. However, it is unclear whether the condescending "spirit of rationality" that Bishop describes should be attributed to academic mathematics or, instead, its practitioners and enthusiasts. More importantly, though part and parcel of academic mathematics, it is uncertain whether objectivism and (Western) rationality favor or further Western colonialism. To us, this seems like an open question.

Decolonizing instruction by inviting students to use their mental powers to build awareness of mathematical ideas and reasoning

Recontextualizing institutional mathematics for instruction is a historical, social, and economic activity and, in most countries, shaped by colonialist ideologies. Whereas we have so far focused on how recontextualization produces school mathematics curricula that can transmit colonialist messages, we turn our attention to the possibility of mathematics instruction that students experience as decolonizing.

Essentially a decolonizing instruction experience engages learners in a culturally mediated act of educating their awareness to create mathematical ideas and reasoning using their mental brilliance and agency. Notably, mental brilliance and intellectual and emotional agency naturally occur in human beings. These claims coincide with results obtained by, among others, the psychologist, epistemologist, and mathematician Caleb Gattegno (1970/2010, 1973/2000). Based on his studies of how children acquire natural language, he theorized their "powers of the mind" or, as we call them, indigenous mental brilliance to be among those in Table 1.

Recognizing those powers of the mind, Gattegno constructed a pedagogical approach he termed "the subordination of teaching to learning" (Gattegno, 1970/2010). At its core, the approach invites learners to engage in tasks designed to allow them to continue as agentic beings employing their powers to build knowledge. Practitioners of this approach to mathematics teaching have offered rich, challenging accounts of learners' accomplishments in constructing powerful and personal mathematical ideas (see, for example, Coles, 2011; Powell, 1993, 2023).

Indigenous Mental Powers		
Extracting	Abstracting	Interpreting
Transforming	Recognizing	Analyzing
Visualizing	Anticipating	Synthesizing
Evoking images	Noticing patterns	Wondering
	Stressing and ignoring	

Table 1: *Theorized indigenous mental powers*.

Another underlying component of Gattegno's pedagogical perspective is embodied in this statement: "*we separate questions of language and notation from those of awareness of the relationships*" (Gattegno, 1963/2011, p. 15, original emphasis). The separation that Gattegno mentions identifies two categories of mathematical content within mathematical curricula that Hewitt (1999) terms and elaborates as arbitrary and necessary. The first category refers to semiotic conventions such as names, labels, and notations. Those cannot be constructed or appropriated through attentive noticing or awareness but instead must be given and retained through memorization and association. Unlike the first, the second category of mathematical ideas can be derived or built by attending to and noticing relations among objects. In this sense, these relations are (logically) necessary and, by inviting students to engage in appropriately designed tasks, can be left to students to discern. Discerning mathematical relations among objects and expressing those relations are two complementary processes.

Furthermore, for mathematics, the subordination of teaching to learning is a pedagogical practice supported by a decolonialist view of what it means to do mathematics. The approach is grounded in Gattegno's (1987) ontological and epistemological view of mathematics:

> No one doubts that mathematics stands by itself, is the clearest of the dialogues of the mind with itself. Mathematics is created by mathematicians conversing first with themselves and with one another. … Based on the awareness that relations can be perceived as easily as objects, the dynamics linking different kinds of relationships were extracted by the minds of mathematicians and considered per se. (p. 13-14)

This view is discursive and participatory as it also implies learners' agentic use of their will. They use their will, a part of the active self, to focus their attention so that their minds observe the content of their experience and, through dialogue with themselves and others, they become aware of the particularities of their experience. In mathematics, the content of experiences, whether internal or external to the self, can be feelings, objects, relations among objects, and dynamics linking different relations.

To support subordinating mathematics teaching to its learning, a framework for working is practical. It consists of an instructional model containing a cluster of four action phases for a curricular unit that is often longer than a single class meeting. The cluster consists of a coherent, flexible set of instructional actions to support learners to work individually or collaboratively to educate their awareness about ideas of a mathematical topic. The modes attend to the arbitrary and necessary categories of mathematical content. Powell (2018) describes the four instructional actions as actual, virtual, written, and formalized. Furthermore, Amaral et al. (2021) and Powell (2023) detail implementations of those instructional actions for teaching fraction knowledge.

A decolonialist instructional task based on subordinating mathematics teaching to learning

Grounded in the theoretical foundation of the subordination of teaching to learning described in the previous section, we now exemplify a decolonizing instructional task. Importantly, it is embedded in a cultural context with familiar elements: numerals, annuli, colors, and numerical arrays. The pedagogical approach provides learners with what is arbitrary and invites them to use their indigenous mental powers to discern and describe what is necessary and, thereby, build mathematical knowledge for themselves. The task described enables learners can engage and build upon their understanding of multiplicative ideas as they decipher what is encoded in the Numbers in Colors chart (Figure 1), including skip counting or multiples, common multiples, least common multiple, divisors or factors, common factors, greatest common factor, composite and prime numbers, exponentiation, factorization, prime factorization, and the unique prime factorization of a natural number. That is, the task can lead learners to articulate the Fundamental Theorem of Arithmetic as their insight.

The instructional practice employed with the task requests that learners to use their mental powers to educate their mathematical awareness. To be aware is to perceive, notice, and be mindful of the fact of something. For example, considering the Numbers in Colors chart below in Figure 1, we can see several things: numerals, each numeral has a segmented or unsegmented annulus surrounding it, and each segment is colored. Furthermore, we can notice there are six rows with ten numerals in each row and, starting at the top of the chart, from left to right, the numerical array is in numerical order from 1 to 60. Together, being mindful, those noticings are currently a part of our awareness. If we were to speak or write about our noticings, then, like ourselves, others can know some of the content of our awareness.

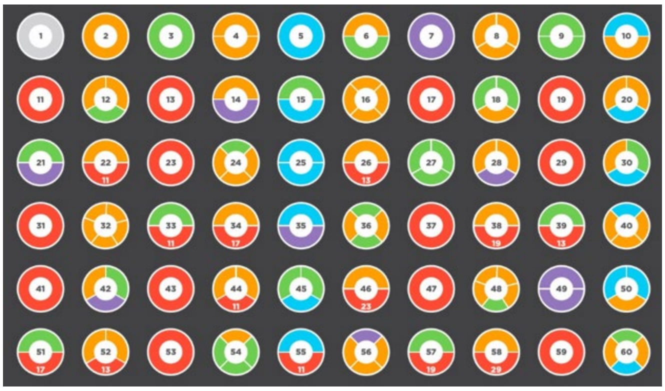

Figure 1: *Numbers in Colors chart.*[1]

Moreover, we can use our enhanced awareness to make further sense of the Chart. One possibility is we can see some annuli share the same color, such as the ones surrounding the numerals 2, 4, 6, and so on have orange in common. Being curious about that noticing, we can formulate a question: "I wonder what is common about those numbers that they should share orange as a common color of their annulus?" We can notice that these numerals represent every other number starting with 2, even numbers or multiples of 2 or, said another way, numbers with 2 as a divisor. We are, therefore, aware of a connection between a shared color and a number pattern or sequence. The number 2 is a factor or divisor of those numbers with orange in its annulus. Noticing, wondering, and making sense are ways to educate our awareness.

To further educate our awareness, we can stay with what we discerned previously. We can now notice that all segments of the annulus of some of those numerals are only colored orange and wonder what property those number share. Seeking to answer our question, we can see those numerals—2, 4, 8, and so forth—have annuli with respectively 1, 2, 3, and so on segments. Continuing to reflect on our question, we ultimately recognize those numerals are powers of 2: 2^1, 2^2, 2^3, …. Those noticings and wondering served to deepen the education of our awareness of mathematical ideas discernible in the Numbers in Colors Chart. But, of course, the Chart has plenty of other numerical properties to be discerned and described.

[1] The chart comes from Dan Finkel and Katherine Cook's website, mathforlove.com, where it is an element of their game, Prime Climb. We changed the chart's name so as not to prime (pun intended) students invited to decode it.

It is essential to recognize that the frame of mind in which the above noticings and wonderings arose is akin to the state of mind students experience when they previously sifted and sorted the array of noises they heard from older individuals in their home and community from which they discerned complex features of language and developed their ability to speak their first language(s). In those sifting, sorting, and developing processes, they employed specific mental powers (Gattegno, 1973/2010). As such, we know they have the intellectual acuity to decipher the Numbers and Colors chart. Therefore, we should allow them to experience the joy of doing so by inviting them to engage their indigenous mental powers and to use their oral and written language assets to work with others on the deciphering task.

It is worth mentioning characteristics of our pedagogical approach that differ from instructional methods such as discovery learning and problem solving (see, for example, Goldin, 1990; Schoenfeld, 2007). In our approach, for specific mathematical topics, teachers identify aspects of content that are cultural conventions and those that can be built by using mental powers to notice relations among objects and dynamics among relations. Further, they invite students to engage in cultural tasks designed for students to recognize their need to use their mental, physical, and affective resources to produce specific cultural awarenesses or culturally based mathematical ideas and reasoning. Moreover, like the Algebra Project's method (Moses & Cobb, 2001), the subordination of teaching to learning is grounded in students' lived experiences and purposely details and bridges as equal their experiences and everyday language to the canonical oral and written symbolic representations of salient mathematical features.

Conclusion

In this paper, we offer what we believe is a unique perspective on decolonizing school mathematics; one that differs in key ways from what we identify as an emergent, near-consensus view that is rooted in the idea that "Western mathematics" is inherently colonialist and, as such, that the school mathematics curriculum needs to be entirely recontextualized if not entirely displaced or replaced (Fernandes, 2021; Foster et al., 2022; Greene & Mukhopadhyay, 2017; Iseke-Barnes, 2022). Our view is that, rather than the problem being rooted in academic mathematics or so-called "Western mathematics," the problem is how this mathematics is recontextualized as school mathematics and how that is presented to students. As decolonizing school mathematics is a nascent research area, we anticipate new developments and are excited to consider new contributions and understandings. For example, we believe there is promise in examining the language of mathematics instruction as a site where colonizing and oppressive ideologies are maintained. We encourage other illustrations of instructional approaches decolonizing mathematics education by inviting learners to be protagonists of mathematical ideas and forms of reasoning.

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