On "New Waves" in Mathematics Education Research: Identity, Power, and the Mathematics Learning Experiences of All Children

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Abstract

During the past few decades, identity has emerged as a key to studying the sociocultural and sociopolitical character of mathematics learning and teaching and has been linked directly to conceptualizations of mathematical proficiency. Along with the attentiveness to issues of identity, mathematics education researchers have also begun to "take power seriously" in an effort to better understand the ways in which students' mathematics-specific learning experiences are framed in- and outside of the classroom, by what and by whom, and with what consequences. In this paper, I discuss the recent social- and sociopolitical-turn moments in mathematics education as context for the emergence of identity as an analytic tool. To touch on how issues of identity and power intersect and are being taken up, I draw on a recent study that examined the identities of students who were enrolled in a non-credit-bearing remedial mathematics course as they transitioned from high school- to college-level mathematics.

Key words: Mathematics identity, equity, mathematics learning experience

> When mathematics, so effective in creating useful stories about the physical reality around us, is also applied in crafting stories about children (as in "This is a below average student") and plays a decisive role in determining the paths their lives are going to take, the results may be less than helpful. More often than not, the numerical tags with which these stories label their young protagonists, rather than empowering the student, may be raising barriers that some of the children will never be able to cross (Sfard, 2012, p. 8).

As part of a broader "social turn" in mathematics education research (e.g., Lerman, 2000)—and, perhaps more recently, a sociopolitical turn (Gutiérrez, 2010)—there has been growing attention to the role of identity construction as an element of mathematical thinking and learning (Sfard & Prusak, 2005; cf. Bishop, 2012). Although many conceptualizations of identity have emerged or been incorporated from other areas of inquiry (e.g., psychology, philosophy, sociology, anthropology), mathematics education researchers have recast and operationalized identity in mathematics-specific terms and contexts (Bishop, 2012; Esmonde et al., 2011; Larnell, under review; Martin, 2000, 2007; Sfard, 2008)—including "formal" and "informal" settings (e.g., Nasir & Hand, 2008). Furthermore and importantly, these mathematics-specific notions of identity have been associated with conceptualizations of mathematical proficiency (National Research Council, 2001; cf. Bishop, 2012), suggesting that identity construction plays a central and deeply embedded role in students' development in mathematics learning and teaching situations.

The purpose of this article is twofold: (a) to briefly present the social and sociopolitical contexts in which identity has emerged as an analytic tool for research and (b) to present an exemplum of these "new waves," drawing from a recent study of mathematics identity that I conducted with African American students transitioning to postsecondary mathematics courses.

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With regard to the latter, my work with mathematics identity centers on its psychosocial properties; that is, can mathematics identities be threatened and/or damaged—by what and by whom, amid what situations, and with what consequences? Toward a broader agenda of using identity as a lens on issues of equity (but also inequity) in mathematics education, I focus on the mathematics learning experiences of African American students and the increasingly problematic context of remedial mathematics courses.

Background and Theory

As a new wave or development during the 1980s, a growing collection of researchers amid the social turn recognized that mathematics teaching and learning included much more than the traditional, triadic relationship between teacher, student, and (context- or culture-"free") subject matter. Instead, this otherwise simple relationship was situated among nested levels of socialization (e.g., schools, communities, societies, histories and traditions) and influenced by a multitude of potential social factors, such as race, gender, and culture (Weissglass, 2002). Ideas and questions about the intersections between mathematics education and conceptions of race, gender, equity, classroom discourse began to surface in research and policy (e.g., National Council of Teachers of Mathematics, 1989; Secada & Meyer, 1989).

Between the social turn and the more recent sociopolitical turning[1], concerns about social forces on mathematics learning were translated into recognition that learners were developing their identities in contexts of unequal—and oftentimes inequitable—power relations. Another point of differentiation between the social and sociopolitical turns is the manner by which race and other markers of difference are included in the analysis of identity. Although the tides were changing, much of the research on race during the social turn did not extend beyond assigning people to categories in order to compare them to others. In the sociopolitical-turning moment (Figure 1), researchers are openly interrogating relationships between mathematics education, identity, and power in fundamentally new ways—for instance, ways in which race is characterized and used in the field (Martin, 2013); the ways in which equity has been and continues to be conceptualized (Gutiérrez, 2008); and the ways that connections among equity, identity, and power interact through poststructural (Walshaw, 2013) or critical postmodern theory (Stinson & Bullock, 2012). As the sociopolitical turn came into focus, identities were seen as co-constructions of students' various selves—for instance, as mathematical and raced, gendered, or sexualized (Martin, 2000, 2007). A methodological need during the sociopolitical turn, therefore, is the operationalization of identity; that is, how does one know it when one sees it? In keeping with the social turn and its focus on discourse, viewing mathematics identity as something that develops in talk may be a useful starting point.

[1] I refer to it here as "turning" because, although others may claim that the sociopolitical moment has come to pass writ large, it is certainly arguable that we continue to grapple with the transition from mere recognition of issues of identity and power to the development of theories and methodological tools with which to implement these still-emergent ideas in research, policy, and practice. Moreover, the political and policy-oriented elements of this "moment" are still nascent (e.g., Common Core State Standards for Mathematics, the federal Race to the Top initiative, public-private/charter schools; right-to-work legislation).

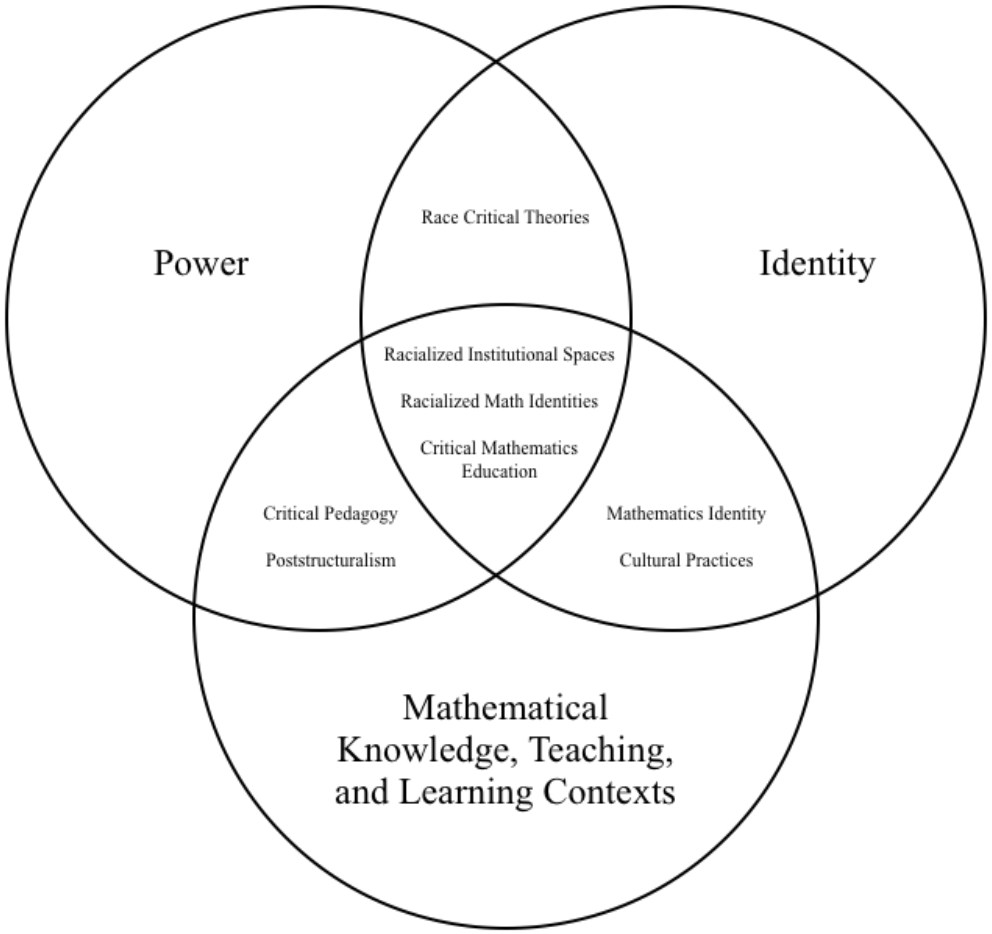

Figure 1. Representation of the Sociopolitical-Turning Lens[2]

Mathematics Identity: An Operational Definition

Although identity has become, at present, "the bread and butter of our educational diet" (Hoffman, 1998, as cited in Sfard & Prusak, 2005, p. 14), many accounts in identity-oriented research do not provide a clear way to view or use the construct; that is, there is seldom an operational definition of what identity is and what it looks like, in an empirical sense. Among the many potential candidates for an operational definition, Sfard and Prusak provide a compelling argument that identity may be regarded as a narrative construct—more precisely, that identities *are* narratives (cf. Sfard, 2008).

Furthermore, Sfard and Prusak (2005) define identities as narratives that bear three critical features: they are *reifying*, *endorsable*, and *significant*. To be reifying, an identity must bear the quality of saying something about the subject's state of being (as opposed to their doing), thereby orienting the narrative's subject with "strong explanatory force" as a distinguishable kind of person (Lindemann Nelson, 2001, p. 93; cf. Labov & Waletzky, 2003). A narrative is endorsable if, according to Sfard and Prusak, "the identity-builder, when asked, would say that it faithfully reflects the state of affairs in the world" (p. 16). While this is helpful as a guiding

[2] The figure includes a selection of elements that are represented by the sociopolitical-turning lens and the ways in which they possibly align to issues of identity, power, and mathematics knowledge, teaching, and learning contexts.

statement, it seems necessary to provide additional justification beyond the identity-builder's attestation of truth. To complement the identity-builder's testimony, an endorsable narrative must also bear some "correlation to action" (Lindemann Nelson, 2001, p. 95).

Lastly (but certainly not least), a narrative is significant if "any change in it is likely to affect the storyteller's feelings about the identified person" (Sfard & Prusak, 2005, pp. 16-17). Although the authors attempt to move beyond the vocabulary of affect, belief, and feelings, this part of their definition does not. So, to cast it slightly differently, a narrative is significant if it "possesses the right amount of heft" (Lindemann Nelson, 2001, p. 96). That is, "the criterion of heft underscores the idea that identity-constituting narratives are woven around the features of people's lives that they, or some of the rest of us, care about most" (ibid). In this way, significance as heft also signals the identity-builder's evaluation of the narrative (cf. Labov & Waletzky, 2003). In my use of this framework and in accordance with Juzwik's (2006) response calling for more attention to the idea of "narrative," I further specify that "identities-as-narrative" must also, at least, be *minimal narratives*, a sequence of two or more causally linked and/or temporally ordered clauses, that satisfy Sfard and Prusak's identity criteria (Labov & Waletzky, 2003)[3].

With this operational definition of identity, it is still necessary to say how it may be used to discern a certain *mathematical* type of person—that is, a person who uses, learns about, or thinks specifically about mathematics at a given time. Given the criteria that specify a narrative as an identity, a *mathematics identity-as-narrative* must also refer to or signify the subject's (a) "ability to perform in mathematical contexts," (b) sense of the "instrumental importance of mathematical knowledge," (c) "constraints and opportunities in mathematical contexts," and/or (d) "the resulting motivations and strategies used to obtain mathematical knowledge" (Martin, 2000, p. 19). This interpretive step is key in not only selecting mathematics-specific identities from narratives that may also signal other kinds of identities, but also towards highlighting the subject-specific socialization factors that interact with mathematics learning experiences (ibid).

Identity Contingencies: Threat and Agency

Along with offering new conceptualizations of mathematics identity (also see Bishop, 2012; Solomon, 2012), more researchers are employing identity toward understanding the psychosocial effects of certain kinds of mathematics learning experiences (Larnell, 2011, under review; McGee & Martin, 2011; Nasir & Shah, 2011). The connection between the identities that learners construct and the experiences that ensue, these researchers argue, is influenced by a range of mediate narratives whose effects are wide-ranging. Much of this scholarship has centered on the relationship between these broad narratives and resilience, agency, positioning, appropriation, or to a lesser degree threat. This is not altogether new (albeit new to research literature in mathematics education).

In the capstone of his and his colleague's work on the phenomenon known as *stereotype threat*, the social psychologist Claude Steele (2010) claims that identities often have costs—that they mark us for certain kinds of treatments based on our association with communities in which identities are shared (cf. Lindemann Nelson, 2001). He argues that these costs, these contingencies on who we are, apply pressure that may influence our performance or behavior in

[3] This would disqualify single clauses as identities in or of themselves, thus responding to Juzwik's (2006) central critique of Sfard and Prusak's argument. Put differently, a reifying clause does not constitute a whole identity (e.g., "I am a mathematician" or "She is a wonderful mathematics student"), although they are often the handles by which we wield identities.

settings in which the contingencies are evoked. *Identity contingencies*, "the things you have to deal with in a situation because you have a given social identity," may serve to either affirm or threaten our identities in a setting. Outside of mathematics education, research on identity contingencies has largely focused on threat. As a counterpoint to the deficit-oriented rhetoric that abounds in mathematics education, research on mathematics identity contingencies—those things that you have to deal with in mathematics learning contexts because of the identities you construct—have largely focused on agency and resilience.

An Exemplum: A Study of Mathematics Identity amid the Transition to College

To illustrate these concepts and, particularly, the utility of mathematics identity as a lens on mathematics learning experiences, this paper draws on a broader project aimed at studying the experiences of African American students enrolled in remediation courses during their first year as university undergraduates. Although the study centers on the experiences of African American students, I would suggest that the theoretical and methodological tools extend well beyond this particular group. (I will revisit this claim in the discussion.) By attending to issues of identity co-construction in the context of inequitable access to mathematics, moreover, the study bespeaks the tenor of the sociopolitical turning agenda.

The primary unit of analysis was students' narratives about their academic and mathematics learning experiences. Although the selection of data presented here represents a single participant (pseudonymously referred to as Cedric), the study included participants from a cohort of 28 students who were then entering their first year as students at a large, Midwestern university in the United States. Furthermore, the students were enrolled in a non-credit-bearing mathematics course required for students whose scores on the university's mathematics placement exam were among the lowest in the entering class. These courses are notorious gatekeepers in the mathematics pipeline, often requiring students to repeat them (sometimes multiple times) before advancing to courses that contribute to college graduation. At the time of the study, the university at which it was conducted enrolled more than 2,000 students *per semester* in these remedial mathematics courses. As is too often the case, African American students were enrolled in disproportionately high numbers (Attewell, Lavin, Domina, & Levey, 2006).

Based on the results of a questionnaire that asked students to report on a number of dimensions of their personal and academic backgrounds, a group of eight students (including Cedric) was selected to participate in a series of interviews that spanned a full academic year. For the purpose of this paper, Cedric was selected because of his academic success as a high school student and, despite his placement in a remedial mathematics course, his remarkable high-school mathematics course background.

Selected Findings

Cedric is an African American male from a small, in-state city (fewer than 10,000 residents) located within 50 miles of the university that he attended. At the time of the study, he was an 18-year-old, first-year undergraduate. Previously, Cedric attended the local, public school in his hometown, and he excelled academically. He finished high school ranked among the salutatorians of his graduating class, and he took advanced courses in all disciplines, including mathematics (calculus in his third year):

> *Cedric:* Well, I think that there were maybe five hundred students in the whole school. I think that only one hundred or so graduated in my class. Well, I was

> salutatorian. But it was a lot of hard work in high school. But yeah, I was a good student.

Across the interviews, students were asked a series of questions related to the influence of socialization factors on their academic and, especially, mathematics learning experiences (cf. Martin, 2000). Cedric cited his family and home community as especially influential on his academic success. He also spoke of the influence of academically high-achieving peers:

> *Cedric*: I think that me and my friends kinda had like the same vision. Like we basically wanted to go somewhere. We all got into the higher classes, the honor classes. Like a lot of my friends were salutatorians along with me, so.

Cedric's mathematics identities. Despite his past academic success, Cedric's transition to college and, particularly, being placed into a remedial mathematics course had a considerable and negative influence on his mathematics identity development. Near the beginning of the term in which he took the course, Cedric openly discussed his changing sense of his own ability to perform in mathematics contexts.

> *Cedric*: Well, I'm not going to say that I totally don't like math. But math has always been something that I kinda struggled with. I can always say, though, that I do like it when I understand it. So, um, I knew that in math I had to work just a little bit harder, so that's basically what pushed me to get good grades, to basically put in the best that I could.

As Cedric continued to question his placement in the remedial mathematics program, he also began to do his own detection work. As he discussed during the second interview session, he often took stock of other students' engagement in the classroom. While he took his notes and attended to the lectures, he wanted to know what others were doing, trying to understand who they were as mathematics students. As he made comparisons to himself and his own practices, he was particularly attuned to the practices of his African American peers:

> *Cedric*: Like, um, it brings to mind like—I guess, like—I kinda question what's their work ethic like. Are they just going to give up on the class? Or are they going to try to do their best? Try, even though it may be a struggle now, just to try to and get through it. And like, um, I don't know; it's just—I see a lot of African American students that have dropped the class or just aren't there anymore, and like I'll see them come in and sometimes they'll just leave and [...] I don't know, it's just kinda [...] It kinda opened my eyes up to like where I am.

The reader may wonder, at this point, how such a high-achieving student like Cedric—who successfully completed calculus before matriculating to the university—landed in an algebra-focused, remedial mathematics course in the first place. Among his mathematics identities, particularly those in which he discussed his motivations and strategies, he began to shed an especially revelatory light on the math placement examination experience. As the data from other students confirmed, his experience was not an isolated one.

> *Cedric*: I took the placement exam, I think, uhm, right before [first-year orientation], I think... Uhm, I think that there was a deadline for the math placement exam, and uhm, my [orientation] was during June. I can't remember when the deadline for the math placement exam was. Yeah.
>
> *G. Larnell*: So, what did you think about the test?
>
> *Cedric*: Yeah...during the math placement test I just, kinda just rushed through it. Like, I finished my—we had block classes in high school, so I finished my calculus class in my junior year. I didn't have any math in my senior year. So, some of the stuff I was just like, uhm, 'I don't know,' 'I don't know,' and I clicked off, basically through the whole math placement test. So, yeah.

Cedric exhibited considerable pride in his academic status, particularly during early stages of the study, but this scenario was strikingly inconsistent with such positioning. Drawing from other examples in which students effectively sacrificed their trajectories while satisfying testing requirements in minimally sufficient ways—often to find presumably "safe spaces" to land within the university mathematics pipeline—these situations exemplify what I have elsewhere termed *identity satisficing* (akin to behaviors that occur in public opinion polling; Larnell, 2011, under review; cf. Berinsky, 2004).

Threat and agency. As Cedric continued to question the academic environment, his mathematics learning experiences, and himself as a mathematics learner, he also continued to verify what he thought was a consistent (and consistently reified) message within the institutional environment: that African American students were overrepresented in the lowest mathematics courses at the university. He looked in a number of places, becoming what Steele (2010) calls a "contingency detective" (p. 141). In other words, he began to notice how the institutional setting "was organized by identity," a narrative that he endorsed and found significant (ibid):

> *Cedric*: It just; okay, when [the instructor] explained that this was—[the instructor] basically said that this was a remedial course. [The instructor] was like, um, this is the lowest course that you will take at [this university]. [The instructor] said that it doesn't get any easier than this. And then I kinda looked around, you know, and I see that most of—even when I go to the [math help sessions]—I see that most of the students there in [the remedial course] are African American.
>
> I mean I see it. I walk these halls every day. I see who's in these classes. I'll see calculus on the board, and no black students in the seats. Sometimes one or two... Okay. I just feel like [...] it [...] I don't know, it kinda hurts me to see so many black people, like me, in the classroom. I just feel like we're [.....] I feel like we could do better. [.....] Like, if we're going to come to [this university], then um, and just be put in the [remedial] class, and then to see people, like um, just drop out of it; that just, kinda like, hurts me, because it, kinda like, says to me, 'okay, African American students can't succeed in this class, you know.' And it's remedial, the lowest class, so [...] So, it's kinda [...] I don't know.

Cedric was beginning to recognize and evince a *threatening masternarrative* depicting African American experience with the mathematics courses at the university. But he wasn't just constructing it from thin air; Cedric had accumulated enough contextual cues from the institutional environment to give rise to this narrative. For him, the air was thick with threat. According to Steele (2010), for the contingency detective, "cues implicating one's marginality" are major; "the number one such cue is the number of other people in a setting with the same identity—the 'critical mass cue'" (p. 140). Over time, Cedric continued to construct this masternarrative in relation to his own mathematics identity, even after he completed the actual course experience.

> *Cedric*: The word [remedial] means like simple or, like, dumb. Well, I don't want to say 'dumb,' but...(whispers: And how it applies to the course that I just took?) I think that most of the material was simple. But...and I feel like...Okay. Like when people ask you, like, what course are you in, [the remedial course], it's kind of like, "well, gee, you're really bad at math." So, yeah.

It would be tempting for some to end the story here, where narratives that map on to broader discourses of deficiency would have irrevocably negative effects (or damage) on mathematics identity-making. As Steele and others have consistently argued, however, identity threats are not permanent or decisive influences. Even during his course experience, as the threat was mounting, Cedric began to resist the emerging masternarrative.

> *Cedric*: I really wouldn't know what to say. Because I know that the fact that I'm in [the remedial course] doesn't determine that I'm dumb at math or anything like that. I think that I'd probably just let that slide. In the inside, I know that I'm going to pass this course; I'm going to go on to [the next course] and I'm going to do well in that course, too. So, yeah.

Over the course of several months, there was clear evidence that Cedric was wrestling with his own mathematics identity construction with respect to broader narratives about the experiences of African American students. But there was equally clear evidence that Cedric was determined to resist those deficit-oriented masternarratives, and that resistance also took the form of a narrative—an agency-oriented *counternarrative*.

> *Cedric*: It actually does. It pushes me. It pushes me to do better in the classroom. I'm already here, but I want to do better; get a good grade in the class. I want to prove that, you know, there are African American students that will get a good grade in this class. That we'll succeed in this class. [...] It pushes me more than it pushes back.

For Cedric, the masternarrative of underperformance and failure pushed him to achieve more and to resist its lure. Cedric's counternarrative was especially robust and left no space for the threat to infiltrate his narratives. As was the case in this episode, counternarratives are constructed under circumstances in which the stock plot, or masternarrative, does not fit nicely with the individual's experiences. These narratives of resistance perform just as Cedric's did, and deconstruct the unfamiliar parts of the masternarrative and explore their validity (as Cedric did with his contingency detective work). Counternarratives can also act as ways to repair an

infiltrated identity—even a temporarily affected one—by offering an alternative that is based in the individual's experiences.

Discussion

As the sociopolitical turn progresses, it is critically important that researchers broaden their conceptions of mathematical proficiency to rigorously investigate the social and psychosocial forces that impact mathematics learning. As the study described here aims to demonstrate, identity-as-narrative can be a central and useful tool for analyzing the mathematics learning experiences of students and, particularly, students from groups that have experienced restricted access to mathematics. This is a crucial moment, a "new wave" itself for mathematics education and, arguably, one of four similar points during the past half-century (Stinson & Bullock, 2012; Martin & Larnell, in press). By broadening our characterization of proficiency in mathematics, attending to the ways in which racialized narratives influence learning particularly (Nasir, 2011), and questioning the ways in which educational institutions draw power and status from the status quo, the presently unfolding sociopolitical turn may help us to gain traction on some of our most egregiously persistent and prevailing inequalities in mathematics education.

In this article's opening epigraph, Sfard (2012) reminds us that mathematics has not only become an unmistakably useful tool for creating stories about physical reality, but it has also become a decisive tool for creating distinctions among its learners' aptitudes. This dual (socially constructed) nature of mathematics has undeniably raised barriers for some children, as she rightly points out. Inasmuch as these raised barriers may account for abridged access for some, however, mathematics has also allowed us to create mythic narratives for other groups that promote their members' access in ways that are only verisimilarly empowering. For instance, the narrative that stems from the statement, "Asians are good at math," is as affirming as it is threatening, largely due to its supposed and indiscriminate prescriptiveness (Nasir & Shah, 2011).

Although the study described in this article centers on the mathematics learning experiences of African American students, the roles of identities and other kinds of narratives are applicable for all students—across all possible groups therein. Partly due to the co-emergence of racialized achievement gap rhetoric, the influx of second-language learners from Latina/o communities, and the push for equity in the field of mathematics education, most of the current research that examines the identities of mathematics learners within the context of inequitable power relations focuses on the experiences of African American and Latina/o learners. As the sociopolitical turning continues, however, it will be imperative to begin to examine other intersectional identities and the ways in which even those deemed successful are actually experiencing mathematics learning and teaching.

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