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## Mathematical Autobiography as a Window into Sociopolitical Teacher Identity

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### Abstract

This paper describes a study of sociopolitical mathematics teacher identity. Twelve prospective math teachers (PMTs) wrote multistage mathematics autobiographies (mathographies) in a mathematics methods course. We present an analysis of their narratives, making use of two distinct theoretical lenses, to consider how the PMTs may be negotiating emergent sociopolitical mathematics teacher identities. Implications for the preparation of mathematics teachers will be considered.

**Keywords:** mathematics teacher preparation, teacher identity

### Introduction

Underlying the work of the Mathematics Teacher Education Partnership (MTE-Partnership) to improve the preparation of secondary mathematics teachers are numerous challenges that fall under the umbrella of “equity,” such as recruitment and retention of a diverse pool of prospective mathematics teachers (PMTs) as well as preparing them in a manner that ensures they recognize that each and every student has the potential to make important mathematical contributions. A more complex challenge is articulated in the MTE-Partnership Guiding Principle 6-C (2014), “Sense of Justice: The teacher preparation program fosters a sense of agency in its teacher candidates so that through their actions, behaviors, and advocacy, candidates demonstrate a dedication to equitable pedagogy that promotes democratic principles by holding high expectations for all students, while recognizing and honoring their diversity.” The recent AMTE Standards for Mathematics Teacher Preparation (2016) press further on the development of this sense of justice in Standard C.4, “Social Contexts of Mathematics Teaching and Learning” (p. 23), including an understanding of the roles of power, privilege, and oppression in the history of mathematics education. Related, the AMTE Standards also call for the PMTs to learn to support the development of positive mathematical identities within each one of their students. Mathematics teacher preparation is a key location for shifting the culture of mathematics teaching to attend to issues of equity, identity, and critical consciousness (Aguirre, Mayfield-Ingram, & Martin, 2013).

Equity issues such as these can be considered from a sociopolitical viewpoint (Gutiérrez, 2013; Mellin-Olsen, 1987), a perspective that examines the students produced by mathematics education, in which traditional dimensions of identity interact with agency, authority, and power. PMTs bring to their teacher preparation programs ideals and assumptions about education and mathematics, informed by both societal views and their own experiences in mathematics classrooms. Mathematics teacher educators that embrace sociopolitical goals often aim to disrupt these assumptions, to prepare PMTs with an awareness of themselves and their students as sociopolitical actors in a complex world. We call this orientation, when taken up as one’s own, or, when sustained and performed over time, a sociopolitical mathematics teacher identity (Gargroetzi & Lawler, 2017).

In some teacher education courses, though in few mathematics methods courses, autobiographical projects are used to promote critical thinking and unearth ideological assumptions. The work produced through these projects can provide a window into the ways that PMTs are negotiating their emerging teacher identities. In this study, we examined how 12 secondary PMTs envisioned and articulated what it might mean to be, become, or act as a critically conscious mathematics teacher through an extended autobiographical writing project specifically attending to mathematics experiences, as both learners and teachers. Specifically, we sought to consider:

1. How are the PMTs negotiating emergent sociopolitical mathematical teacher identities, and
2. In what ways are they thinking about future students' mathematical identities?

### Identity

Identity, as an analytic tool (Gee, 2000; Sfard & Prusak, 2005), provides a way to focus on the dialectical relationships between cognitive and social views on learning (Stentoft & Valero, 2009), possibly erasing the distinction. In critical mathematics education (CME) scholarship, identity, in both perspectives, is understood to inherently entail the negotiation of agency, authority, and power as it plays out both in and outside the classroom, and draws on social, cultural, and political discourses of both mathematics and belonging (Frankenstein, 1983). Sociopolitical approaches to mathematics education demand that we ask about the intersections of power and identity with learning and knowledge (Gutierrez, 2013). A sociopolitical mathematics teacher identity suggests a critical orientation to the work of teaching, schooling, and mathematics, recognizing that mathematics and schools produce people, even as they are simultaneously constructed by people. As such, a sociopolitical mathematics teacher identity entails, at least in part, attending to the emerging and performed mathematical identities (Aguirre, Mayfield-Ingram, & Martin, 2013) of one's own students.

The authors in this study situated themselves theoretically and analytically with two different approaches to identity, Positional and Post-Epistemological.<sup>1</sup> Gargroetzi takes a sociocultural and dialogic approach to identity, focusing specifically on positional identities. Positioning Theory (Davies & Harre, 1990) describes the construction of self as a negotiation of available "subject positions" and "storylines," often pre-existing. For example, all-knowing teacher and un-knowing student are two potential positions in the storyline of traditional classrooms. As individuals position themselves or are positioned by others toward available subject positions ("identities"), the ways in which they take up or reject those positions in turn shapes the positions subsequently available. Over time, repeated positionings may thicken into identification with certain positions and storylines over others, thus becoming a more sustained identity (Wortham, 2006). However, as with any discursively constructed position, these positions and identities are always open to disruption.

The use of Positioning Theory for inquiry into identity has been identified as appropriate to sociopolitical goals in the mathematics education research field in that it affords attention to both individual agency and pre-existing sociopolitical structures and brings together questions of identity and power (Herbel-Eisenmann, Wagner, Johnson, Suh, & Figueras, 2016; Langer-Osuna & Esmonde, 2016). For example, positioning theory allows one to consider whose positioning of whom is taken up, and whose is rejected? What pre-existing storylines, such as urban students as trouble-makers, or Asian students as good at math, make one positioning more likely than another? What are the rights and duties associated with each position, and what positions are made available in one context verses another? As PMTs position themselves and their students through their autobiographical

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<sup>1</sup> Each perspective reflects a poststructural inclination. Positioning Theory, as drawn upon by Gargroetzi, aligns with the poststructural orientation to decenter the subject. The personal epistemology orientation Lawler develops aligns with the poststructural disruption of a realist ontology, problematizing the power relations bound up in the production of knowledge.

writing and reflection, they may articulate, accept, reject, and alter particular notions of what it means to be a math teacher, or to become or act as a sociopolitical mathematics teacher.

Lawler's interest in identity emerges from a constructivist's orientation to ontology, in which *viability* in an experiential world is substituted for the notion of *truth* in an experiencer-independent reality (von Glasersfeld, 1995). He is concerned with personal epistemology, an individual's beliefs about the nature of knowledge and knowing, including what knowledge is and how it is constructed. Specifically, Lawler's work investigates when and how a generative orientation to mathematics is sustained through adolescence while the broader sociocultural discourse seemingly works in opposition. While many adolescents seem to express a personal epistemology of *external authority* or *silence* (Belenky, Clinchy, Goldberger, & Tarule, 1986), Povey and Burton (1999) argue that the personal epistemology of *author/ity* may be a better target; it is an emancipatory identity. Rather than seeing the truth of mathematics as determined externally, to view oneself as not only the author of one's mathematics, but also the person who determines what is true or not speaks to the personal epistemology of *author/ity*. "If mathematics is understood as the 'telling of a story,' then each of us gains greater autonomy as an author of that mathematics, but not at the expense of a deep commitment to the social context of life and meaning making" (p. 236). That is to say, seeing oneself as an author of mathematical truths, suggests that one must recognize that each other person, like oneself, authors such truths as well. And for this reason, there is great commitment to and value of the other (Lawler, 2012).

A focus on *author/ity*, children as mathematical authors, resembles a discursive (poststructural) orientation to identity as characterized by Langer-Osuna and Esmonde (2016), but is distinctly poststructural in the attention to knowledge and identity as they are bound up and enacted in power relations among knowers, specifically in the mathematics classroom. Thus, personal epistemology, i.e. identity, is not the sum of multiple categorizations; rather, identity is discursive, negotiable, and thus fragile and dynamic, better characterized by "discontinuities and disruptions" (Stentoft & Valero, 2009, p. 58). Through the discursive opportunities of their autobiographical writing and reflection, PMTs negotiate ideas of both what it means to know and do mathematics, as well as what it means to know and do mathematics teaching. As these personal epistemologies emerge, likely the PMTs will also consider the development of knowledge by their future students, potentially positioning them as authors of mathematics, creators of knowledge (Povey & Burton, 1999).

### Methods

This exploratory, qualitative study drew upon autobiographical narratives of PMTs to consider their negotiation of sociopolitical mathematics teacher identities. Although the MTE-Partnership Equity Working Group has not yet been formalized into a Research Action Cluster (RAC), this exploratory study aligns with the premise of the MTE-Partnership network as a design community drawing on improvement science (Bryk, Gomez, & Grunow, 2010), and will likely inform future PDSA cycles suggested by the Working Group's soon-to-come driver diagram. In this study, we examined the challenges put forth by MTE-Partnership Principle 6-C, Sense of Justice, and AMTE Standard C.4, Social Contexts of Mathematics Teaching and Learning.

To conduct this study, we pursued a method of narrative inquiry in which we systematically gathered, analyzed, then selected elements of PMTs' stories as told by them. Stories, in this case autobiographies, are reconstructions of a person's experiences, remembered in a particular context / moment in time, and for a particular purpose. This has a bearing on which stories are told, and how they are told. They are not stories of life as lived, but a re-presentation of one's life as told by the person. As a result, subjective meanings and sense of self and identity are negotiated as the stories unfold. Narrative inquirers strive to attend to the ways in which a story is constructed, for whom and why, as well as the cultural discourses that it draws upon.

Autobiographical and auto-ethnographic work (e.g. Dunn, 2005) has been used to support PMTs in becoming aware of and reflecting on their own mathematics experiences to think critically about their attitudes and beliefs about mathematics teaching and learning. Mathematics teacher educators make use of autobiographical writing in mathematics methods courses to press PMTs to examine social, cultural, and ideological assumptions as they learn to teach for diversity through mathematics (e.g. Aguirre et al., 2013; de Freitas, 2008). In this study, we drew upon the autobiographical writing produced in a mathematics methods course that explicitly engaged PMTs in questions from a CME tradition of teaching for equity and social justice, to better understand how PMTs engaged in this work envision and articulate what it might mean to be or become a critically conscious mathematics teacher. That is, we sought to learn what we could about their sociopolitical mathematics teacher identities. Analytically, the autobiographical reflection work of PMTs provides a lens into the ways they negotiate their own ever-evolving identities as critically conscious educators.

The 12 participants in the study were enrolled in Lawler's fall 2016 course "Teaching Mathematics in the Middle Grades." Drawing from a critical orientation to issues of equity and social justice, among Lawler's course goals were to challenge and broaden PMTs ideas about mathematics education. To address assumptions about teaching mathematics PMTs bring to the methods class, Lawler utilized a multistage mathematics autobiography (mathography) to draw out PMTs' awareness of their own identity as a person who does (and learns and creates) mathematics and as a person who teaches mathematics. This explicit attention to the sociopolitical mathematics teacher identities of the PMTs also may encourage them in turn to become more attuned to their own future students' mathematical identities.

Gargroetzi and Lawler separately examined the data collected, relying on emergent coding to identify themes across the writings of all 12 students. As certain themes became particularly salient such as the linkages between how PMTs discuss the mathematical and sociopolitical identities of themselves or their students, Gargroetzi "zoomed in" to analyze the micro-interactional positioning accomplished within the writing itself that told these stories, focusing on examples from the work of a few students. Similarly, Lawler analyzed the text collectively to capture samples that seemed to demonstrate various epistemological perspectives, such as author/ity, and positioned the PMTs' future students as mathematical authors—or not.

### Findings

Gargroetzi's analysis, from the Positional approach, identified a variety of stances (i.e. positions) that PMTs were taking toward themselves and their role in the mathematics classroom. Some of the stances could be organized into Gutiérrez' (2002) dominant and critical approaches to equity: access/achievement and identity/power. Others didn't fit so neatly into those categories, and thus were labeled as Crossover—referring to the manner which the first two stances seemed to be intertwined. Samples of these stances can be found in Table 1.

Text from the PMTs writing serves to illustrate these stances. A first example demonstrates a stance centered on access, access to mathematical knowledge as disciplinary, as well as access to love of math, both as bounded items held by the teacher and available for distribution at the teacher's discretion: "teachers ... gave me my love for math. They created a fun environment that was challenging yet rewarding. These are the people that make me want to pass my knowledge onto other students and share my love of math" (H, M). This example is structurally about providing access. In this second example, emphasis lies on a different teacher role, one in which the teacher serves as a connector between mathematics and other elements of student's identity (and life):

My main goal for myself as a teacher is to create lessons that apply to my students' day to day lives. I do not see the point in teaching mathematics if you do not also teach how it is applicable

to them personally. In order to do this I have learned that I first must give opportunities for my students to identify as mathematicians. As a result, my main goal for my students is to help them see the value in their schooling as well as helping them see their value as students. (J1, L)

Table 1

*Stances (i.e. positions) PMTs took toward themselves and their role in the classroom*

Stance Type	Example
Access & Achievement	Teacher as gate-opener to beauty and joy of mathematics Teacher as protector from potential trauma
Power & Identity	Teacher as encourager of student confidence and independence Teacher as facilitator of connections between the classroom and the student's lived world Teacher as learner, students as people to learn from
Cross-over	Teacher as change-agent for a conceptual, exploratory mathematics education that will include all students

These orientations to the dominant and critical axes in Gutiérrez' (2012) framework seemed to intertwine in this crossover stance: "I want to create student-led lessons, lessons that involve groupwork and give my students the opportunity to participate in their learning rather than simply being recipients of my instruction" (N, L). This PMT positions students as capable and desiring of participating in their own learning even as she positions herself as the one who holds power over the access to that experience.

These three stances as articulated by PMTs at different moments reveal varying orientations to the relations of power between teacher and student. While the dominant orientation positions the teacher as the gate-keeper to knowledge or experience, even potentially liberatory experience, critical stances position the teacher as a participant and collaborator in the student's always-already engaged pursuit of meaning-making, as well as positioning the student as an other from whom meaningful wisdom can be gleaned.

Lawler analyzed the data from a post-epistemological standpoint with an orientation toward what may constitute evidence of a personal epistemology, specifically the author/ity orientation (Belenky et al., 1986; Povey & Burton, 1999). That is to say, Lawler did not attempt to create models of any PMT's personal epistemology, rather focused on the process of identifying what may constitute evidence. Three personal epistemological perspectives were apparent: silenced, external authority, and author/ity. The first of the perspectives, silenced, is characterized by the person experiencing themselves as mindless and voiceless, subject to the whims of an authority for knowing external to themselves. The following passage from one PMT's mathography suggests this perspective, "I remember very clearly the sweaty palms, nervous itch, feeling of suffocating, and the anxiousness whenever I had to take a math test, or when my teacher asked me a question in front of the entire class" (S, M). The silenced PMT does not see herself as developing, acting, learning, planning, or choosing.

A second perspective is of external authority, in which authority for knowing is experienced as external to the self and belonging to the experts. "Meaning is taken as given and knowledge is assumed to be fixed and absolute rather than contextual and changeable" (Povey & Burton, 1999, p. 234). Several of the examples provided by the PMTs are as follows:

- "helping students to understand" (J1, M)
- "Math has always made me feel empowered, even when I struggled with it the most" (N, M)

- “I hope to teach them how to be persistent in discovering mathematics, and I hope to teach them how to research and discover concepts on their own.” (J1, L)

The third perspective observed in PMTs personal epistemologies was author/ity. When one views oneself as an author, they use their (mathematical) voice “to enquire, interrogate and reflect upon what is being learned and how” (Povey & Burton, 1999, p. 232). “External sources are consulted and respected but they are also evaluated critically by the knowledge makers, those making meaning of mathematics in the classroom, with whom author/ity rests” (p. 236).

- “I like knowing that when I finished a problem I know I have the correct answer.” (SI, M)
- “I feel that if I would have learned to explain myself I wouldn't struggle as much as I do now in my university level classes. Many times I am unable to find the words to show that I know what I am doing. I have to take the time and really examine the process I used to come to my conclusions.” (NR, M)
- “I am excited to learn different perspectives that my students will have that differ from my own.” (J1, L)

These examples of PMT identity that aligns with a personal epistemology oriented toward author/ity suggest a future teacher who will support a renegotiation of the relations of dominance embedded within current conceptions of the nature of mathematical knowledge. This personal epistemological perspective values meaning making, and recognizes the vitality and importance of the process of mathematical knowledge construction within a community of learners, relocating the privileging of mathematics from outside experts to child authors, generating a liberatory classroom practice (Povey & Burton, 1999).

### Conclusions

This investigation served two purposes, primarily to understand better PMTs sociopolitical mathematics teacher identities. Second, to inform future work by the MTE-Partnership Equity Working Group as they consider strategies to address PMTs tacit ideological assumptions and provide a structure for the mathematics teacher educator to promote sociopolitical goals. This work suggests the potential for multistage mathematical autobiographies built around activities in the mathematics methods course to promote sociopolitical mathematics teacher identities.

Further, and more broadly, the introduction of the idea of a sociopolitical mathematics teacher identity may contribute to the present work on identity occurring in the field. We consider a sociopolitical mathematics teacher identity entails, at least in part, attending to the emerging and performed mathematical identities of one's own students—whether taken up as one's own, or, sustained and performed over time. Giving attention to the emerging sociopolitical mathematical identities of prospective teachers is one element of achieving the more complex, justice-oriented goals in the preparation of mathematics teachers.

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