

CONTRIBUTING FACTORS TO SECONDARY MATHEMATICS TEACHERS' PROFESSIONAL IDENTITY

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Our study explores contributing factors informing secondary mathematics teachers' professional identity. Data from five semi-structured interviews were evaluated using the provisional coding method. Results indicate mathematics identity, beliefs about teaching, and beliefs about mathematics all play an integral role in the ways teachers discuss their professional identity with some differences found between teachers' level of experience. This work informs the field by expanding on an existing framework to deepen our understanding of professional identity.

Keywords: Affect, Emotion, Beliefs, and Attitudes; Teacher Beliefs

Research into teachers' professional identity aims to understand the interplay between the social and individual perspectives to identify the thoughts, influences, and impacts they have on a teacher's image of self (Beijaard et.al, 2004). A teachers' professional identity can have a large impact on their persistence in their profession (Hong, 2010). Teachers' view of themselves and their experiences act as motivators for their beliefs, actions, and future goals, which in turn affect their commitment, teaching quality and decision making (Hong et al., 2017). Exploring teacher professional identity has the potential to shed light on the high attrition rate of teachers in the field, factors that may support or inhibit teacher growth, and factors that may link to teacher practices and decisions related to their profession.

This study draws on research identifying specific components as important to teachers' professional identity. For example, Canrinus et al. (2012) asked teachers about their job satisfaction, self-efficacy, occupational commitment, and change in level of motivation as a way of exploring their professional identity. Further, we explored components discussed in prior research alongside teachers' content specific identity (mathematics identity) to better understand how these identities may overlap and inform one another. The research question informing our study is: how do secondary mathematics teachers describe their professional teaching and mathematics identity through the lens of prior research?

Methods

Participants

Table 1: Participant Information

Participant Pseudonym	Degree	Years of Experience	Position
Lilly	Bachelors	1	Primarily teaches grades 6-8 within an elementary school setting
Mary	Bachelors	1	Primarily teaches grades 7-8 within an elementary school setting
Bailey	Masters	5	Primarily teaches grades 9-12, focused on Algebra II, within an high school setting
Eva	Masters	16	Primarily teaches grades 6-8 within an elementary school setting, a Nationally Board Certified Teacher

Anisha	Masters	15	Primarily teaches grades 9-12, focused on Algebra I, within a high school setting
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While this study included 36 secondary mathematics and science teachers, for the purpose of this paper, we included 5 secondary mathematics teachers. These teachers were in the first summer of their first year participating in a multi-district professional development grant and had varied levels of experience (see Table 1). These participants were all female and classified themselves as Caucasian, Non-Hispanic.

Data Collection and Analysis

Semi-structured interviews were conducted with each of the participants. In order to capture teachers' professional identity, questions about their self-perceptions (e.g., how would you describe yourself as a math teacher), how others viewed them (e.g., how do you think your administrators view you as a math teacher), motivation for going into the profession (e.g., why did you become a teacher), and future self (e.g., if you exited the field of teaching today, how would people describe the legacy that you left behind) were asked.

The provisional coding method was conducted to code interviews, which entails beginning with a set of a priori codes that draw from prior literature (Saldaña's, 2015). The a priori codes we used were based on five constructs explored in Hong's (2010) article: emotion, commitment, value, micropolitics, and self-efficacy. Hong (2010) included an additional a priori code, knowledge/beliefs, which we did not initially include as it was anticipated that mathematics identity would capture some of these ideas. However, we did end up including some additional codes related to beliefs during the coding process. In addition to these codes, we created a list of a priori codes based on four factors identified in prior research related to mathematics identity (Cribbs et al., 2015): interest, recognition, competence, and performance. After the initial round of coding, the additions to the original list were discussed and a consensus was met on a new list of codes. Further detail about these codes will be provided in the results.

Results

Four overarching themes emerged: professional identity, mathematics identity, beliefs about teaching, and beliefs about mathematics. Aspects of professional identity and other influential factors - taking into account the complexity of construct - will be discussed.

Professional Identity

There were initially five a priori codes (themes) used in exploring professional identity: emotion, commitment, value, micropolitics, and self-efficacy. These themes were further broken into sub-themes, creating a set of 11 themes.

Emotion. Out of the 5 participants, only one participant had evidence of the theme emotion, which connects specifically to stress, burnout, and well-being. Bailey described an incident that was "so rough that I almost decided not to continue teaching." However, it was evident through this interview as well as the other interviews how interconnected many of the themes were. For example, when discussing her struggles with the profession, Bailey indicated that district expectations (micropolitics - structures and support) were a primary reason for the tension she was experiencing in her position. It was only when she moved to a different teaching position that these tensions resolved and her persistence in teaching (commitment) was evident.

Commitment. Statements related to the theme commitment were evident in each of the participant interviews. For example, when responding to a question on how the profession was viewed by those outside of it, Lilly indicated that the perception of math being difficult "motivates" her. In all but one case, Bailey, commitment was discussed with reference to outside perceptions (community or

society) of the profession and in terms of countering perceptions or motivating a sense of commitment due to these perceptions.

Value. Within the value theme, utility was evident in two of the interviews where teachers indicated a “calling” related to them pursuing the profession. Interest was evident in four out of the five interviews, with teachers indicating enjoyment in teaching and even connecting the “love” for teaching with caring about kids. Importance was only evident in two interviews with statements relating to making a “difference every day,” particularly for their students.

Micropolitics. This theme was evident at a much higher frequency than the previous themes through the three sub-themes (decision making, status, and structures and supports). Decision making was only evident in two of the interviews with Bailey indicating a lack of autonomy as a professional due to requirements by the district (“they took away zoom math and that was something that the district pushed heavily for us to have students use which we didn’t always agree with...”). The other sub-themes were evident in all five interviews. With reference to status, both Lilly and Bailey positioned themselves as novice teachers. Other comments indicated differing levels of status within the larger community (others outside of school or society) such as teaching perceived as “not very good” by others or having an elevated status because “you know, just working with that level of students.” Finally, teachers had varied levels of support and structures in place as evident in their comments. However, comments seemed to indicate perceived support from administration across all interviews.

Self-efficacy. Self-efficacy was the final theme evident under professional development and included four sub-themes. The first sub-theme was classroom management and was evident in all of the interviews. Comments by Eva and Anisha indicated a high level of efficacy at being a “good classroom manager” compared with the less experienced teachers who expressed comments such as “my classroom management is not the greatest right now.” This finding is not surprising given the varying levels of experience. Student engagement was evident in three of the five interviews, with two teachers noting struggles with engaging students with comments such as “I’m guilty of often times kind of being a boring teacher” but also indicating that they viewed engagement as important and necessary for effective teaching. Instructional strategies, much like engagement, focused on challenges and strengths of the teachers. Nearly every teacher mentioned struggling to connect the real world with the math content. Overall, strengths for strategies focused on collaborating and working with students. Finally, the general sub-theme for self-efficacy focused on statements about being effective with teaching, but often without enough specificity to know what that meant to the teacher.

Mathematics Identity

Mathematics identity included the sub-themes interest, performance, competence, and recognition.

Interest. Three of the five teachers indicated interest and/or enjoyment of mathematics as a subject area. All these comments related to why they decided to teach mathematics. For some of the teachers, interest in the content area seemed to connect to their teaching, but this was not the case for other teachers who either discussed these ideas separately or did not discuss interest in the content or interest in teaching.

Recognition. Two of the teachers specifically discussed being recognized in mathematics. One teacher discussed this through teacher recognition when she was a student, and the other teacher discussed her role in helping others, being positioned/recognized as knowing mathematics.

Competence. Three of the five teachers discussed experiences related to their competence with mathematics, with statements such as “it was something that I got.” As with interest, most of the comments related to reasons for why the teacher decided to teach mathematics. However, two

teachers indicated that students knowing that they [the teacher] understood the content was something they wanted their students to know or felt that they knew about them.

Performance. Three of the five teachers also discussed performance with mathematics. All these comments related directly to their rationale for choosing to teach mathematics.

Beliefs about Teaching

Beliefs about teaching was a theme that emerged in our second round of coding. Four of the five teacher interviews provided evidence of their teaching beliefs. Two of the teachers (Lilly and Bailey) seemed to be trying to reconcile what they thought effective teaching looked like or what they had hoped it would be like with their current practice. Other ideas such as being an enthusiastic teacher, learning through problem solving and different strategies, and students being actively engaged were discussed by the teachers.

Beliefs about Mathematics

Beliefs about mathematics was a theme that also emerged in our second round of coding for two of the four teachers. Lilly's responses seemed to indicate a belief that mathematics is applicable to the real world and that all students have a capacity to learn mathematics. Conversely, Bailey's comments seemed to indicate that students were either a "math person" or not a "math person", such as stating that "he is not a math kid" and "you either love it [math] or you hate it [math]."

Discussion

Findings support the inclusion of the constructs explored in Hong's (2010) study, but also support the inclusion of additional factors that seemed to play a role in teachers' professional identity as evident in the interviews we conducted. Figure 2 provides an overview of themes by participant to help convey some of these patterns with the size of bubbles aligned with the frequency of the code.

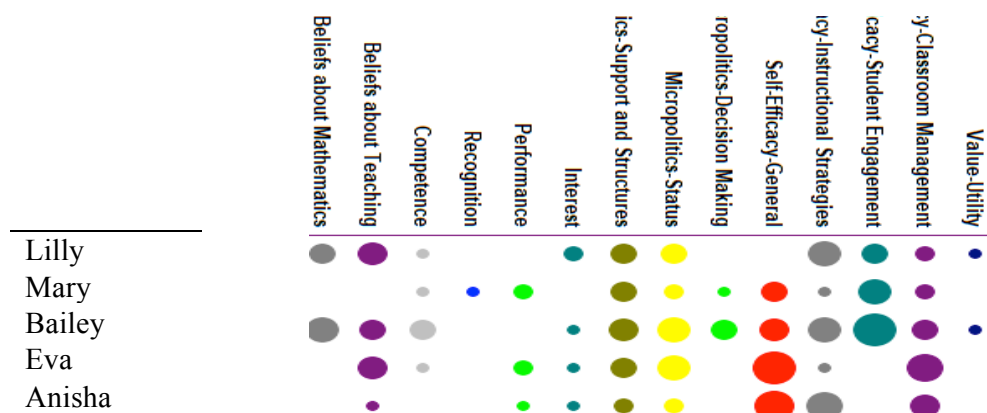


Figure 2: Trends Based on Frequency of Theme and Participant

Although there is value in considering teachers' professional identity individually, exploring the construct in relation to other factors helps to provide a more complete picture of how teachers may see themselves within the larger community of educators.

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