Identity Work of a Prospective Teacher: An Argumentation Perspective on Identity

Carlos Nicolas Gomez
Clemson University

An investigation on the identity work of a prospective teacher is conducted to better understand how the participant argued for recognition of her projective mathematics teacher identity. Characteristics of the claims, evidence, and anticipatory statements used are explored. Using an argumentation framework, the participant's discourse demonstrated differing strengths for the claims she was making. These were referred to as levels of ownership depending on the number of criteria met (I-statements, hedging, and intensifiers). This helped find the ideas central to how she wanted to be perceived as a mathematics teacher. Evidence for the participant's claims came in two different ways, anecdotal and belief oriented. The anticipatory statements were used in three ways, (a) to provide details; (b) to recognise constraints or limitations; or (c) to enact defensive/protective practices.

Keywords · projective identity · identity work · discourse · prospective teachers

Introduction: Identity and Discourse

The identity as a teacher-of-mathematics has been described as the framework the individual uses to evaluate his or her mathematics practice (Peressini, Borko, Romangnano, Knuth, & Willis, 2004). As prospective teachers go through their teacher education programs, they are exposed to a series of interventions pushing the boundaries of what they believe to be mathematics teaching. Their experiences in teacher education programs may differ from prospective teachers' images of teaching attained from their experiences as students in elementary and secondary school (Lortie, 1975). Interventions (activities and tasks) are planned by the institution to have the prospective teachers consider who they are as educators. The interventions, however, do not always have the intended influence on prospective teachers. "Preparation programs deliberately and inadvertently reinforce the development of different kinds of teaching identities as they emphasise various aspects of what it means to be a teacher" (Hammerness, Darling-Hammond, & Bransford, 2007, p. 382). Teacher education programs attempt to influence the trajectory of a prospective teacher's identity as a teacher-of-mathematics.

For example, Lutovac and Kaasila (2011, 2014) explored ways to intervene in prospective teachers' construction of narratives of self-as-mathematics-teacher to shift negative dispositions towards mathematics and beliefs about mathematics teaching and mathematics learning. The use of bibliotherapy and narrative rehabilitation aided the prospective teachers to reflect on

how their own experiences with mathematics may be influencing their images of future self (Lutovac & Kaasila, 2011). Accordingly, teacher educators have a role in supporting the development of prospective teachers' images of future self (Hammerness, 2003, 2006). These images are used by teacher educators as a tool to delve deeper into the prospective teachers' beliefs and ways of reasoning (Hammerness, 2003). As prospective teachers develop their identities as mathematics teachers, they are reflecting, deconstructing, and reconstructing their images of future self (Flores & Day, 2006). Reconstruction is not always positive from the teacher educator's perspective.

A variety of lenses for investigating the professional identity of teachers have been used (Beijaard, Meijer, & Verloop, 2004; Darragh, 2016) including self-conceptualisations (Peressini et al., 2004), discourses (Avraamidou, 2014; Gee, 2001; Sugrue, 1997), narratives (Drake, Spillane, & Hufferd-Ackles, 2001) and crafts (Coldron & Smith, 1999). Each of these perspectives, though, focused on the past and present identities of the participants. As Hammerness (2003, 2006) and Lutovac and Kaasila (2011, 2014) have shown, a focus on the future-oriented self is also important in the development of an identity as a teacher-of-mathematics. Gee (2003) described one's *projective identity* as the projection of one's desired characteristics and values onto an avatar. Although Gee was specifically talking about this action in relation to video games, the projection of one's values and ethics on to a malleable version of oneself is worth investigating in teacher education. Prospective teachers imbue their desired future self (the avatar of self as a teacher-of-mathematics) with their values of teaching and learning mathematics. The projective identity becomes the protagonist in prospective teachers' narratives describing their future practice. Therefore, the trajectory the prospective teacher believes they should follow is determined by their projective identity.

The projective identity of the prospective teacher is influenced by the rational other, or the individual(s) one has social interactions with (Gee, 2001; Goffman, 1959). A challenging aspect of identity that is not often considered is how the individual demonstrates their identity to the rational other (Gee, 2001). Most work (Drake et al., 2001; Peressini et al., 2004; Sfard & Prusak, 2005) has emphasised the individual's internal aspects (beliefs and dispositions) with little consideration of how the individual convinces the rational other of the ownership of an identity. One exception is Bishop (2012), who showed how two students attempted to discursively position one another as they were working on problems from the SimCalc curriculum. Bishop (2012) found the two students used a variety of discourse structures and functions to position one another as mathematically capable. Eventually one student was convinced of her positioning as the 'dumb one.' Bishop's (2012) work demonstrates how argumentation and the rational other are involved in the identity development of the individual. I refer to *identity work* as the argument one makes for the ownership of an identity to the rational other. One must argue ownership of characteristic traits to fulfill the need to be recognised as owning the identity in question. For example, one cannot say he is a mathematics teacher without also providing implicit or explicit evidence. To aid in convincing the rational other of being a mathematics teacher, the prospective teacher must learn the Discourse with a capital "D" (Gee, 2001, 2012) of mathematics teachers.

Gee's (2001, 2003) perspective on identity is a powerful way of looking at one's identity construction through varying Discourses. Discourse with a capital "D" emphasises that when people communicate with one another more than just language is necessary (Gee, 2001, 2011, 2012). "Discourses are all about how people 'get their acts together' to get recognised as a given kind of person at a specific time and place" (Gee, 2012, p. 152). The act of recognition is essential in Gee's (2001) perspective on identity. Others must see and recognise these identities in order for them to be meaningful. The ways an individual behaves, acts, or feels in a particular context is part of the social argument made to be recognised as a member of a community. For example,

prospective teachers practice a Discourse of teacher when entering a classroom. The preservice teachers will practice certain behaviours and ways of speaking, have specific affective reactions, and use selected tools or technologies to be recognised by the other community members as a teacher. The prospective teacher will enact his or her Discourse to highlight their understandings of the ways of being in the community (Coldron & Smith, 1999; Gee, 2001). A prospective teacher is looking to be socially legitimised as a teacher and learning the Discourse of mathematics teachers is how he or she can convince others of membership. However, it is more than just learning the vocabulary used by mathematics teachers. A teacher-of-mathematics Discourse could include demonstrating knowledge of children's mathematical thinking, belief concerning best mathematical practices as defined by an institution or organisation (e.g., National Council of Teachers of Mathematics [NCTM], 2014), a value for conceptual learning, commitment to the students' mathematics, and enacting teacher moves seen as appropriate for the classroom. The discourse one uses is influenced by the various Discourses the individual uses (Gee, 2012).

However, "Discourses are not units or tight boxes with neat boundaries. Rather they are *ways of recognizing and getting recognized* as certain sorts of *whos* doing certain sorts of *whats*" (Gee, 2012, p. 153, emphasis in original). Learning a Discourse is a challenging endeavour. Gee (1989, 2012), borrowing from Mack (1989), used the term *mushfake* to describe a Discourse one has "partial acquisition coupled with meta-knowledge and strategies to 'make do'" (Gee, 2012, p. 178). A mushfake Discourse is a Discourse one is in the process of attaining and attempts to use, notwithstanding their limited experiences and knowledge. As prospective teachers progress through their teacher education programs, they work with a mushfake Discourse as they construct their future images of self-as-teacher. The internal and external aspects of one's professional identity influence the construction of the prospective teacher's narratives of future self. Accordingly, prospective teachers work to modify their own language and actions to fit what they believe to be those of a mathematics teacher. Little is known about how a prospective teacher may argue her identity as a teacher-of-mathematics or if the specific identity has begun to develop. Understanding prospective teachers' identities in a nascent stage is important because this early stage is the foundation of the Discourse the individual will attempt to construct. The identities as teacher and mathematics teacher the individual enters the program with, will influence how they interpret the practice of others (Peressini et al., 2004). One goal of the teacher educator is to provide prospective teachers with experiences to push beyond a mushfake Discourse. It is important to develop a better understanding of the fragments making up the identities prospective teachers have when they enter teacher education programs.

In this article, I report on an attempt to use an argumentation perspective to explore the initial mathematics teacher identity of a prospective elementary teacher. The question guiding this study was: What ways does a prospective teacher argue her projective identity? To begin, I expand on the idea of identity work as described by Snow and Anderson (1987) and Lutovac and Kaasila (2011, 2014). Then I describe the construction of the identity argumentation framework. I continue with the results of the analysis of a prospective teacher's identity using the identity argumentation framework and how the framework was expanded based on its initial use. I conclude with a discussion on how mathematics teacher educators can become more powerful Discourse brokers for prospective teachers as well as how teacher education programs need to help prospective teachers fragment their identities as teachers.

Identity Work and Argumentation

Identity work is the process one goes through to rewrite one's narrative of self (Lutovac & Kaasila, 2011, 2014). Through social interactions, the individual reconsiders his or her past narratives through reflection (Lutovac & Kaasila, 2011, 2014) or constructs images of their future self (Hammerness, 2001, 2003, 2006). The teacher education program provides opportunities to interact with the community of educators the prospective teachers desire to join. These interactions provide the prospective teachers the chance to use the Discourse necessary, at times mushfaked, to convince members of the community of their teacher identity. The opportunity to try new Discourses or use mushfaked Discourses is important for mathematics teacher development. For example, Hodgen and Askew (2007) demonstrated how a professional development experience influenced an inservice teacher, Ursula, to rewrite her narrative of future mathematics practice. Ursula was provided a space where she could confront "traditional norms of teacher authority" (p. 482) and construct new images of mathematics teaching. Ursula was provided the opportunity to practice a potential mathematics teacher Discourse previously not conceivable to her. Teacher education programs construct these spaces for prospective teachers to practice the mathematics teacher Discourse. The opportunity to mushfake the Discourse is there as well. The prospective teachers are prompted to adjust their narratives as necessary to be recognised as a member who is able to use the Discourse of the community.

Identity work, however, is also about convincing the rational other that one's narrative is true and similar to the narratives of those in the community (Snow & Anderson, 1987). Goffman (1959) first explored these notions using the metaphorical idea of actors on a stage. The actor must use his body, language, and other discursive actions (e.g., emotions) to convince the audience of his or her belonging to the context of the stage. The actor provides the audience a *front* while backstage other identity management acts are in place. The actor must use a particular Discourse to convince the audience he or she belongs. The prospective teacher does the same as they enter schools and are asked to work with those in the community. The prospective teachers use their mushfake Discourse to be legitimised. Investigations into how prospective teachers argue their identities as mathematics teachers have not been conducted. These investigations can provide a deeper understanding of how teachers mushfake the Discourse they are learning.

Figure 1 provides an illustration of this process. The left figure is attempting to argue the ownership of a characteristic or trait valuable to the community member (right figure). This argument is developed using the images of the rational other and the individual's narratives of past and future self. The receiver of the argument then uses his or her own images of the rational other and narratives of past and future self to make sense of the argument and considers the validity of the argument. The one arguing ownership then must interpret the feedback (expressed statements, tone, facial expressions, emotions demonstrated, interpretation of words, etc.) provided by the rational other. Then the argument needs to be modified based on the interpretation of the feedback. This back and forth continues. Thereafter, both individuals reflect on the experience of the argument, and there is the possibility of changes in the images of the rational other and the narratives of past and future self. The process described is referred to as an argumentation perspective of identity work.
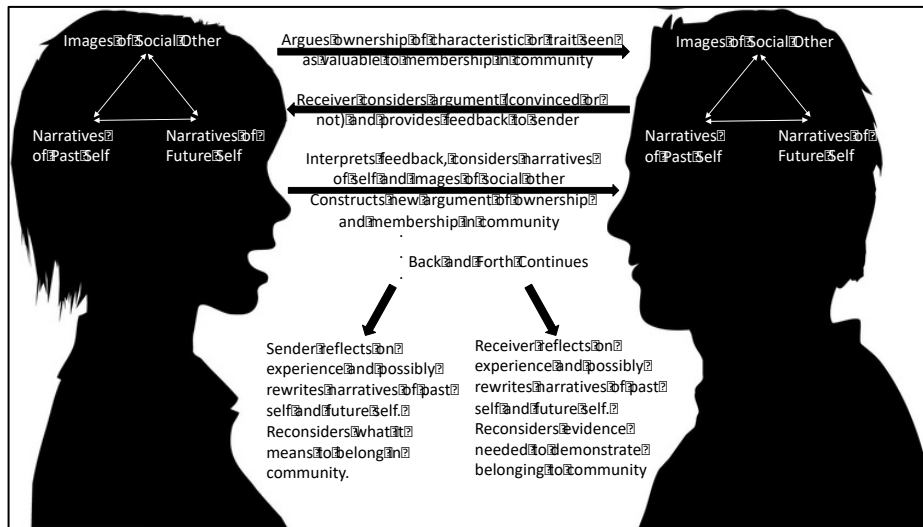
Figure 1. Argumentation Perspective of Identity Work

Prospective teachers must therefore argue their mathematics teacher identity by conducting identity work. In general, argumentation is when one attempts to convince another something is true. Toulmin (2003) provided a framework to break down one's argumentation. Toulmin models have been used in mathematics education research as tools to analyse mathematical arguments in the classroom (e.g. Conner, Singletary, Smith, Wagner, & Francisco, 2014; Hollebrands, Conner, & Smith, 2010). "Toulmin's model offers both a language to describe argumentation and a means to structure the components of an argument" (Wagner, Smith, Conner, Singletary, & Francisco, 2014, p. 10). At the core of any argument structure are three components (Toulmin, 2003). The first is the claim or the statement of truth one is attempting to establish. Then there is the data or the information the claim is based on. Finally, the warrant is the justification linking the data to the claim (see Figure 2).

From the argumentation perspective of identity, data, warrants, and claims are used by the prospective teacher to convince the rational other their narrative demonstrates their inclusion into a particular community. To dig further into the data, warrants, and claims used by a prospective teacher, a framework was developed using identity and discourse literature. A prospective teacher attempts to demonstrate their identity as a teacher-of-mathematics through social interactions, using mushfake Discourses, and arguing the ownership of characteristics believed to be needed to belong to the community. All in all, the goal is to have others legitimise or recognise the individual's identity as a teacher-of-mathematics in public spheres. This view of identity differs from those studied previously in mathematics education (Drake et al., 2001; Hodgen & Askew, 2007; Lutovac & Kaasila, 2011; Timoštšuk & Ugaste, 2010) because this perspective focuses on the identity the individual projects as a front (Goffman, 1959) to the rational other.
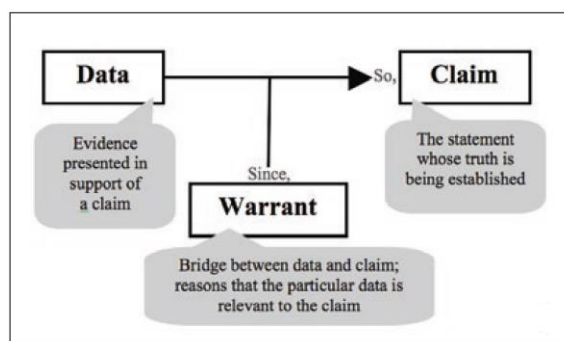
Figure 2. Core factors of Toulmin diagrams and descriptions (Wagner et al., 2014, p. 10)

Theoretical Framework: An Argumentation Perspective on Identity

Toulmin's (2003) perspective on argumentation informed the construction of an initial framework to investigate a prospective teacher's projective identity. The goal of the framework was to help explore how the components of an individual's argument are used. I started with consideration of the claims. I decided on three criteria based on identity and discourse literature to place a degree of value or ownership on the claims being made. The first criteria focused on the participant's use of I-statements. According to Gee (2000), "where people choose to speak as an *I* is consequential for how they are here and now fashioning themselves in and through language" (p. 415). In other words, *I-statements* demonstrate a self-positioning (Harré & van Langenhove, 1991) within the current context. For example, "I am an honest person" is a claim in which the individual positions him- or herself characteristically and within the moral order. The claim "I am a reform-oriented mathematics teacher" has the individual positioning him- or herself within an institution. Positioning oneself as a reform-oriented mathematics teacher in the institution holds some warranted assumptions (e.g., student-centred classroom, inquiry based). Harré and van Langenhove (1991) stated I-statement positioning is not always intentional but sometimes tacit or unconsciously done. Overall, I-statements are a way the individual exposes their identity as they position the individual in a narrative (Sfard & Prusak, 2005).

The second criteria of ownership of a claim focused on whether the claim was hedged. A *hedge* is a word or phrase attaching a degree of uncertainty to the statement (e.g., "sort of", "maybe", "especially"). The individual adds a fuzziness to the claim by hedging (Lakoff, 1973) and "convey[s] a sense of vagueness" (Rowland, 1995, p. 333). Thus by hedging a claim, the participant is demonstrating an uncertainty in their positioning. Uncertainty can be either a positive or negative trait depending on the context. Regardless, if an individual hedges his or her claim, the researcher must consider the uncertainty he or she placed on the claim. Hedging, therefore, weakens the claim, but a claim having uncertainty opens a space for possible change. Consider the following claim, "*I guess* after that [calculus course] I just decided I had ample math experience for my life and so *I guess* that's where I am with right now" (Eyre, Int. 1, emphasis added). In regard to Eyre's identity, her uncertainty about her position of having "ample math experience," and of her current identity being in relation to such a vague stance, is important. It is possible a critical event, one perturbing Eyre's current position, could potentially shift her projective identity to one needing more mathematics content.

The final criterion of ownership focused on the individual's use of an *intensifier*, which I refer to as words adding a higher or lower sense of value to the claim (e.g., "really", "essence", "very", "little bit"). Lakoff (1973) considered some of these terms to be hedges, but it was important to consider the ways the participant attempted to set a value to her claims. Part of arguing for one's identity as a teacher-of-mathematics includes the projection made by the individual to the rational other (Gee, 2001; Goffman, 1959). Therefore, the prospective teacher attempts to place higher value to particular actions or discursive moves (the Discourse of a mathematics teacher). Consequently, he or she positions him- or herself within the desired community of educators. These acts or teacher moves may be those valued more as one attempts to enculturate him- or herself in schools and classrooms. For example, consider Eyre's statement, "I *really* would like to foster group discussion and *really* involve everyone—make everyone feel an equal part of the discussion" (Eyre, Int. 1, emphasis added). Eyre's use of the word *really* in her argument is meant to demonstrate a level of commitment above the average to fostering group work and involvement of students in discussion. Thereby, she attempted to show a higher value for these teacher acts. Consideration of an individual's intensifiers aids in understanding the actions valued, which according to Peressini and colleagues (2004) is a part of the constellation making up the individual's identity as a mathematics teacher.

The three criteria were ways individuals demonstrate ownership of the claim being made. The term *ownership* was used due to the implicit ways these discursive moves made the claim stronger. Furthermore, by using the aforementioned criteria a value could be placed on individuals' claims. The individual positions these traits in relation to his or her projective identity (Gee, 2003). Therefore, individuals take full ownership of a claim if an I-statement, no hedges, and an intensifier are present within the claim. Partial ownership was determined by only meeting two criteria, and limited ownership was described by only one criterion. This initial first iteration of the claims would aid in seeing how individuals emphasise some claims over others, but it does not access some of the nuances of the individual's discourse.

The next argument components to consider were the data and warrants used by the individual. Toulmin (2003) considered these components separately, but because I was not yet concerned with the characteristics of the argument but with the content and use of the argument components these were combined and referred to as evidence. For the purposes of this study, *evidence* was defined as the relevant statements or anecdotes the individual provides to justify his or her claim. Furthermore, evidence was considered as the ways in which the individual was recruiting or calling to the forefront his or her identity (Gee, 2001) as this showed how he or she thought to justify his or her membership.

The evidence provided by the individual was considered as taking two different forms. The first type of evidence provided could be anecdotal in nature. This includes narratives demonstrating possession of a characteristic or providing a context for the claim. The second type of evidence considered was a description of a belief that would consequently lead to the claim. This includes times when one justifies his or her claims with affective reactions one does not have reasoning for (e.g., "It felt right"). These types of reactions are referred to as noncognitive feelings (Clore, 1992).

The final type of statement considered to explore one's argument of a projective identity was the use of anticipatory statements. *Anticipatory statements* were statements where one *backtracked* or added a condition to a claim or evidence as if anticipating a rebuttal, a "condition of exception" (Toulmin, 2003, p. 93). These statements emerged from the initial passes through the data. These statements were made in anticipation to a problematic statement the participant realised once she had verbalised her claim or evidence. Therefore, it was important to consider how these self-corrections were being used. Schegloff, Jefferson, and Sacks (1977) referred to

these statements as self-repair. Anticipatory statements were used in reference to the evidence or to the claim.

A limitation of this iteration of the framework is that it does not take into consideration some of the nuances of the discourse used by the individual. As an initial step, however, it provided an important direction for better understanding the identity of a mathematics teacher (as described below). It should also be noted that uncertainty should not be seen as a negative attribute of a claim. Quite the opposite, uncertainty should be seen as a positive characteristic. Uncertainty defines a space as having the potential for growth and change. It means there is a comfortable scepticism of the beliefs, attitude, and characteristics of one's projective identity. The individual is less likely to resist change if the psychological power holding the belief is weaker (Green, 1971). Additionally, each classification used may have its limitations. For example, the focus on hedging as weakening a claim may initially oversimplify the use of hedges. But as previously stated, this was an initial framework developed for the exploration of the nascent identity as a teacher-of-mathematics of prospective teachers. As with most frameworks, further investigations and development is needed based on results of future work.

Methodology

Participant selection and context

Participant selection was limited to prospective elementary teachers enrolled in the first of two mathematics pedagogy courses in a large university in the southeastern United States. In the program of study, the mathematics pedagogy courses are completed sequentially during the first year. The focus of a larger study was on the experiences of four prospective teachers in the first methods course. The course met twice a week for approximately 90 minutes. After 4 weeks, the class began to meet 1 day a week at a local elementary school with a racially diverse student population: White (43%), African American (39%), Asian (8%), and Hispanic (5%). During those meetings, each prospective teacher was paired with a first-grade student to practice questioning and listening strategies and teacher moves discussed in the course. One of the main goals of the mathematics methods course and its field component is to have prospective teachers listen to and learn from children's mathematical thinking. To meet this goal, the coursework mostly focused on cognitively guided instruction (CGI; Carpenter, Fennema, Franke, Levi, & Empson, 1999), and during the paired meetings, the prospective teachers conducted clinical interviews (Ginsburg, 1997) to get to the students' understanding of operations with whole numbers and fractions. The prospective teachers then constructed their own problem sets for the students on the basis of the results of the clinical interview. This continued for approximately 8 weeks.

Four participants were selected for a larger study on their vision or images of future self (Hammerness, 2001, 2003, 2006) as mathematics teachers. The participants were purposely selected based on observations during the first 2 weeks of the course and a mathematics life story (Shaw & Chessin, 1996) in which they reflected on their experiences with mathematics inside and outside of school. They were asked the following: (a) how they feel about mathematics, (b) what mathematics means to them, and (c) the ways their experiences have an impact on them as mathematics teachers. The mathematics life story and observations aided in finding participants who were already demonstrating clarity or a descriptive vision (Hammerness, 2001, 2003). In other words, the selected participants showed potential for being able to describe their projective identity. Additionally, the participants described a range of dispositions toward mathematics (negative, leaning negative, leaning positive, and positive). For this report, I focus on one participant in order to exhibit the designed framework.

Eyre (pseudonym) was a White female in her early 20s who described in her mathematics biography two highly influential experiences: (1) working at a high-end daycare and (2) missionary work in Africa. She identified herself as growing up in a farming family. The opportunities she had led her to see herself as "incredibly privileged" (Eyre, math autobiography) because she will be the first in her family to graduate from college. She claimed she did not want to be a teacher who views students as disadvantaged, "I need to understand the expectations of my job to educate my students to the fullest extent without viewing myself as some sort of 'savior'" (Eyre, math autobiography). Eyre's roller-coaster narrative (Drake et al., 2001) of experiences with mathematics left her with a negative disposition about her mathematical abilities, but she felt strongly mathematics was key to her future students' success.

Data Collection

For the larger study, each preservice teacher participated in three semi-structured interviews throughout the Spring 2013 semester. Participants were interviewed before, during, and after their experiences working with primary students. Each interview lasted approximately 60 minutes and focused on the exploration of beliefs about mathematics teaching and learning, and their vision of future self (projective identity). Observations of the participants' interaction with students were also made. These observations focused on the questioning and teacher moves enacted to learn about the students' thinking of the mathematics.

For this article, I focus on Eyre's first interview to explore her projective identity at the beginning of her program and demonstrate the potential of an argumentation perspective on identity. The first interview protocol included questions about her beliefs of mathematics teaching and learning, and other background questions. She was also asked to think about how her past experiences in school and working with children had influenced her ideas about mathematics. In addition, Eyre was asked to complete her vision statement (Hammerness, 2006), which was designed to have Eyre discuss her desired future self and context, thereby providing a description of her projective identity (Gee, 2003) before enacting what she had learned in her coursework. Other questions in the interview protocol included: (a) How do you feel about teaching mathematics? (b) What concerns you about teaching mathematics? (c) How do you define success in the mathematics classroom?

Data Analysis

The interview was transcribed and broken into episodes on the basis of the initial question asked and any follow-up questions. An iterative coding process was used for identifying claims, evidence, and anticipatory statements as described in the framework. The data was then blocked into sections by the claim and its corresponding evidence and anticipatory statement (if applicable) within each episode (see Table 1 for example). Each claim was coded for Eyre's use of an I-statement, hedge, and intensifier. Once each claim was categorised for I-statements, hedges, and intensifiers, a level of ownership was applied according to the number of criteria met. For meeting three criteria the claim was coded as full ownership, meeting two criteria partial ownership, and one criteria limited ownership. As stated previously, there is no preference for full, partial, or limited ownership. These categories are designed to show the possible positioning of Eyre's beliefs within her belief system (Green, 1971), but more evidence of these beliefs would be needed to claim explicitly she possessed those beliefs. As an initial categorisation the argumentation identity framework works to understand the ways Eyre sees her future self and the possible trajectories being taken as a teacher-of-mathematics.

To identify the evidence, the question asked by the interviewer and the identified claim had to be taken into consideration. Evidence could be considered as encompassing data, warrants, and backings (Toulmin, 2003) provided by the participant. Eyre's explicitly stated evidence was coded as being either belief influenced or an anecdote used to back up her claim. For example, Eyre claimed she had always had a passion for teaching and gave the following anecdote as evidence:

> I went on a mission trip … and worked in a children's home for four months and while I was there I was put in charge of developing a play group sort of. Like three hours a day lesson plans and things like that and so I really found that passion again that I had had when I was younger. And so, by the end of the four months I was sure that this [teaching] was definitely what I wanted to do with my life. (Eyre, Interview 1)

Eyre recruited this narrative as a way to argue her passion about becoming a teacher, though not necessarily a mathematics teacher, and concluded her narrative with the claim about her projective identity (see Table 1 for other examples).

Table 1 Example of coding scheme and data preparation

Eyre's Response	Claim	Evidence	Anticipatory Statement
Probably in my ideal classroom I would be teaching science. I really love science. I come from a farm family and was really active in agriculture classes when I was in high school and so that applied science was really interesting for me just to see how those sort of concepts can really play into a lot of industries and things like that.	Envisions herself teaching science (Hedges "probably", I-statement, intensifier "ideal"– Partial Ownership)	Affect towards science (Belief); Active in agriculture classes in high school therefore focused on applied science and applicability (Anecdote)	N/a
And so, *I really would like to foster group discussion and really involve everyone. Make everyone feel an equal part of the discussion.* So, if possible in <u>a classroom which size constraints are always an issue</u> - but to have the desks arranged in either a "u" or a circle something along those lines so that fosters more discussion and participation.	Wants to foster group discussion and make everyone feel equal part of the discussion (no hedges, I-statement, intensifier "really"– Full Ownership)	Set up classroom in a "u" or in a circle will foster more discussion and participation (Belief)	Classroom size could be restricting

Key: *Claim* – Italicise   <u>Anticipatory Statement</u> – Underline

Initially, anticipatory statements were seen as attempts at countering a possible rebuttal. The literature had not previously discussed these kinds of statements in argumentation. Therefore, a deeper exploration of these was conducted by revisiting the data and coding for anticipatory statements. Furthermore, after all coding was completed, a grounded theory approach (Glaser & Strauss, 1967) was used to find themes within Eyre's levels of ownership. Possible expansion of the framework was also considered by looking at the evidence and anticipatory statements (see Results below). Deconstructing Eyre's discourse in such a manner was used to investigate the initial projective identity Eyre was attempting to convince the rational other of having.

Table 2 Eyre's argument components

Argument Component (Count)	Subcode	Number coded (Percent)
Claims (60)	Full Ownership	19 (31.67)
	Partial Ownership	25 (41.67)
	Limited Ownership	16 (26.67)
Evidence (39)	Anecdote	14 (35.90)
	Beliefs Based	25 (64.10)
Anticipatory Statements (22)	Provides Details	12 (54.55)
	Recognises Constraints/Limitations	6 (27.27)
	Defensive/Protective Practice	4 (18.18)

Results

In this section, I describe the themes that emerged within the claims and their respective levels of ownership. The majority of full ownership claims related to teaching in general, rather than specifically teaching mathematics, highlighting the need for prospective teachers to fragment their identity as a teacher. Next, I explain the kind of evidence she used for those claims. I then expand the framework by demonstrating three ways Eyre's anticipatory statements were used. Table 2 shows the number of times and percentage each argument component was used when arguing her projective identity.

Claims

Eyre made 60 claims characterising her projected self. Nineteen demonstrated full ownership claims, 25 partial ownership claims, and 16 claims showed limited ownership. There were few claims, in general, directly connected to Eyre's projective identity as a teacher-of-mathematics. Eyre was more comfortable (willing to provide full ownership and partial ownership claims) speaking in generalities even if the questions emphasised mathematics teaching and learning. Eyre was mostly informed by her personal experiences because she was only beginning her teacher education program. Overall, she made few full ownership claims about mathematics teaching. The emerged themes, however, still provide important insight into the trajectory Eyre desired to take as a prospective elementary teacher and possible spaces for mathematics teacher educators to intervene.

Full Ownership Claims. A major theme emerging from Eyre's claims showing full ownership was a focus on equity. She saw her role as a teacher was to lessen stratification among students and foster more equality in the classroom. She made claims like, "I really would like to foster group discussion and really involve everyone, make everyone feel an equal part of the discussion" (Eyre, Int. 1). These claims emphasised her desire to take actions that would construct a more equitable environment for students to learn. Eyre provided no evidence of envisioning her role outside of the classroom in preventing inequities, nor of the ways mathematics can be used to make sense of the world. Much of the evidence provided for her claims about equity dealt with her background growing up as a farm girl, seeing her father's struggle to rise out of poverty, and her missionary work in Africa. These experiences potentially made her aware of the differences individuals have and how teachers should focus on individual strengths:

> I feel that a teacher should differentiate their instruction and really delve into the personalities of their students and their interests and their likes and dislikes their strengths and weaknesses in order to serve everyone well. I know that that's really idealistic and very difficult in a classroom but that would be the ultimate in my opinion. (Eyre, Int. 1)

Eyre's positioning as a farm girl, seeing herself as educationally privileged, and her work as a missionary may have influenced the construction of her desire for an equitable classroom. This is in line with Raymond's (1997) claim that practice is highly influenced by one's background.

Eyre also focused on student engagement because she believed student success was dependent on it. Her envisioned ways of engaging students centred on the incorporation of science and literature. She did not provide specifics, instead keeping the claims as general as possible. "I really would like to incorporate a lot of science in my classroom" (Eyre, Int. 1). Eyre justified her incorporation of science with her experiences as a farm girl, claiming to have gained the knowledge needed to include science in all aspects of her class. On the other hand, for literature, Eyre envisioned having a designated space in her classroom that embodied her love of books. Eyre visualised a setting for the students to acquire a similar affective response to literature as her own by providing a reading space in her classroom. These mechanisms to engage students were highly influenced by her personal affect. She did not provide other forms of evidence and argued these ways of engaging students would aid in constructing her desired learning environment.

Eyre's only mathematics theme in her full ownership claims focused on her goal to connect mathematical constructs to their real-world applications. This was consistent with her mathematics autobiography. "My affinity for math has been best fostered in settings where practical application was opportune, and I hope to employ such applications as often as possible in my classroom" (Eyre, math autobiography). Eyre claimed the essence of mathematics was to make connections between concepts and real-life. It was important to introduce these connections at a young age. "So, I think it is vital that we begin at a very young age to show the applications that can be used with mathematics and then to continue that in middle school" (Eyre, Int. 1). In particular, she argued the application of mathematics to be instrumental for developing students' critical-thinking skills. "I also think that critical thinking is really grown exponentially within work with mathematics, especially applied mathematics" (Eyre, Int. 1). Eyre's full ownership claims focusing on the application of mathematics could be related to her desire to incorporate science into her classroom and how her father was able to use mathematics as a way to progress professionally. Mathematics was the tool needed for Eyre to incorporate science into the classroom.

Partial Ownership Claims. Eyre was more willing to take partial ownership of specific claims about her classroom. As before, however, the majority of these claims were not content specific. Eyre honed in on herself as a teacher by stating some of the acts and activities she would be doing (e.g., dividing up the area of the classroom, fostering community, and keeping parents involved). The claims did not emphasise students' mathematics or the actions students would be taking in her classroom. She was more willing to accept uncertainty in her actions. Keeping the statements general allowed her to construct a space for possible change and modification depending on the context. Overall, more claims about particular acts or activities were coded as taking partial ownership ($n = 9$) than full ownership ($n = 5$) and limited ownership ($n = 3$).

Eyre expanded her projective identity as a teacher-of-mathematics by providing more detailed claims with a partial level of ownership. Her partial ownership claims about mathematics were the criteria for a successful mathematics lesson. For example, Eyre described a successful mathematics lesson as revolving around a problem the students could discover a strategy or technique to use for other similar problems.

> I would say a successful math lesson would be posing a problem that you intended to hone a certain concept for the children and to guide them but not explicitly give them the steps to approaching such a concept and so that if presented with a similar problem at another time they would use that same methodology that they discovered themselves or were guided through by you during the initial lesson. (Eyre, Int. 1)

Eyre saw successful mathematics teaching as involving students taking away strategies and ways to think about problems and not just the procedures. She did recognise the lesson needed to be within each child's reach: "To be within that zone for every child in your classroom would be success in my opinion" (Eyre, Int. 1). Eyre demonstrated she had envisioned her teaching of mathematics to be more than just about the procedures but did not have the language yet to call the learning she desired to be conceptual. Eyre mushfaked her argument because she had not yet attained the language of the community.

Eyre was more willing to make partial ownership claims about her conflict with learning mathematics. She positioned herself as not a good mathematics student and as feeling intimidated by the idea of teaching mathematics. She viewed herself as not a good student due to not succeeding in a college calculus course, at which point she made her decision of having learned enough mathematics. "In the context of learning math, I feel like I have really just kind of decided, I have had enough. And that is not good" (Eyre, Int. 1). She recognised the problematic relationship she had with mathematics but showed no evidence of attempting to find a resolution.

Eyre stated a number of larger societal issues outside of the classroom as part of her partial ownership claims. These claims connected back to her higher ownership claims of equity in the classroom but were generalised for society (e.g., stratification, recognition of the influence of one's background). Eyre's background influenced these claims. In generalising her classroom ideas to society, Eyre softened her claims usually, by not including an intensifier. For example, "I think that we (society) do need to realise that, that where people come from does influence their views and their perspectives and their opportunities" (Eyre, Int. 1). Moreover, her awareness of the current state of funding issues in schools, along with her concerns about teaching mathematics, evolved into a concern for lack of manipulatives and other mathematics resources. Consequently, Eyre claimed she would be concerned about "overextending myself in order to try and compensate to draw those [mathematical] connections" (Eyre, Int. 1).

Limited Ownership Claims. A theme emerging from the limited ownership claims was Eyre's uncertainty with mathematics teaching and learning. Although Eyre took partial ownership of her feelings about mathematics, she took limited ownership to claims about the responsibilities as a teacher-of-mathematics. She did this usually by no longer using I-statements. For example, "You're [Mathematics teachers] not suppose just to tell [students] how to do it" (Eyre, Int. 1) and "The goal of math would be to foster some sort of interest that would continue outside the classroom and foster curiosity" (Eyre, Int. 1). By not using I-statements, Eyre is not including herself necessarily as having the same responsibilities as the general population she is referring to. This distancing is also an example of Eyre mushfaking her Discourse. Eyre is creating a safe space from which to share ideas of the community without yet positioning herself within the community. She justified these claims by providing evidence of lacking certain experiences. Eyre stated she had lacked good mathematics teachers in her schooling and never saw herself as a good mathematics student, concluding, "I guess in a way you have to have a good math teacher to be a good math student" (Eyre, Int. 1). This was concerning for Eyre as she worried about her proficiency in mathematics, leaving her to hope the methods course would help in connecting the mathematics she knew and the mathematics she would be teaching.

Evidence

Eyre only provided evidence for 39 claims. Evidence is not always explicit and, at times, is left implicit because it is assumed the rational other would agree or not question the claim, so this was expected from the participant. The evidence was categorised into two subcategories, anecdotes and belief based. Each of these evidence categories were used 14 and 25 times, respectively.

Each form of evidence was managed differently in Eyre's argumentation. She used narratives in two ways to justify her claims and her projective identity. The first was Eyre highlighted a lack of experience. She took the time to tell a story about her past that focused on a missing experience as a way to corroborate her claim. Out of the 14 anecdotes Eyre provided as evidence, 8 stressed missing out on an experience with most of these (n = 5) concentrating on how mathematics teachers had failed or were unsuccessful. Specifically, Eyre mentioned how her elementary teachers, although they were good at teaching other subjects, did not make the connections and engage her with mathematics like she envisioned. "I feel like a lot of my teachers gave me the bare bones of what was necessary to do the math … math teachers did not seem to engage in the classroom so much" (Eyre, Int. 1). The other 3 lack-of-experience anecdotes emphasised not having worked with students since her mission trip to Africa, her lack of motivation in mathematics, and not having considered student thinking in mathematics.

On the other hand, 6 anecdotes accentuated the experiences she had as evidence for her projective identity. Four of these narratives focused on family and upbringing (i.e., playing school, grandmother being a teacher, fascination with children's programing that took place in schools, mission trip). The other two centred on what her school experiences had provided for her. Eyre emphasised the agriculture classes she took in high school as evidence of her love of science and her identification as a farm girl, along with her work experience with small children. "I come from a farm family and was really active in agriculture classes when I was in high school and so that applied science was really interesting for me. Just to see how those sort of concepts can really play into a lot of industries" (Eyre, Int. 1). Eyre did not use the stories of others to justify any of her claims. In all of the anecdotes provided she was the protagonist. Additionally, the majority of lack-of-experience anecdotes were used to argue traits of her identity as a teacher-of-mathematics. Eyre's have-experience anecdotes, however, did not focus on mathematics, but on her classroom-teacher projective identity.

The second set of evidence Eyre provided was belief based. However, what the beliefs were about varied greatly (teaching and learning mathematics, teaching and learning in general, schools, mathematics, teacher resources, society, and others). This was to be expected as Philipp (2007) stated: "Beliefs might be thought of as lenses that affect one's view of some aspect of the world" (p. 259). Consequently, Eyre's belief clusters (Green, 1971) constructed her view of the world, and being a teacher was organised around multiple experiences and categories. For example, to justify her fondness of CGI she stated, "[CGI] seems to really tailor the way that you approach problems in a way that is most straightforward for a child to be able to think through and succeed in that problem" (Eyre, Int. 1). Eyre justified her claim with a belief about teaching mathematics.

Anticipatory Statements

Twenty-two anticipatory statements were identified. Eyre's uses of anticipatory statements were in response to her evaluation of the claim or evidence after it was shared. This backtracking or self-repair (Schegloff et al., 1977) of identity work was a consequence of externalising her thoughts during the interview. Eyre's use of anticipatory statements had three

purposes: (a) to provide details, (b) to recognise constraints or limitations of teaching, or (c) to enact defensive/protective practices (Goffman, 1959).

The first purpose for Eyre's anticipatory statements was to provide details to the claim or evidence. Out of the 22 times anticipatory statements were used, 12 provided further details (8 for claims and 4 for evidence). By providing further details, Eyre made sure the appropriate message was being communicated. For example, "I think that critical thinking is vital to functioning in our society—*well not necessarily functioning but really succeeding in our society*" (Eyre, Int. 1, emphasis added). Eyre determined the word *functioning* was too strong and in order to not give the wrong impression (incorrect projective identity), self-repaired the statement by substituting "succeeding" for "functioning." Eyre's argument of her projective identity as a teacher-of-mathematics was at stake, so providing details allowed Eyre to refocus the rational other on a specific trait. This was true for evidence as well, "I don't want to be the absolute ruling—*well I mean obviously a teacher has to be an authority figure and I understand that and want to maintain respect with my students*" (Eyre, Int. 1, emphasis added). Overall by providing further details, Eyre attempted to remove the vagueness of the claim or evidence, while at the same time demonstrating uncertainty.

The second purpose behind Eyre's anticipatory statements was to demonstrate recognition of a constraint or limitation of teaching. Eyre used this type of anticipatory statement 4 times throughout her interview. With one exception, these statements were employed by Eyre to display an understanding of the idealness of her claim or evidence. She thereby attempted to convince the rational other she was aware of the boundaries surrounding her image of teaching, but she was still willing to push them. For example, Eyre claimed she wanted to foster group discussion in her future classroom, after which she stated, "so if possible—*in a classroom which size constraints are always an issue*—but to have the desks arranged in either a 'u' or a circle." She thus demonstrated to the rational other she was aware of the constraints of the classroom. Regardless, she will attempt to have her desks arranged a certain way to foster the environment she envisioned. These types of anticipatory statements can be seen as her giving implicit evidence of her projective identity. By demonstrating recognition of constraints and limitations, Eyre is showing she has unmentioned understandings of teaching and learning.

The third type of anticipatory statement was defensive/protective practices (Goffman, 1959), which are the acts or activities one performs to maintain the impression of self (defensive) or another (protective). These can also be considered face-saving moves (Goffman, 1967). Eyre used these statements only 6 times, mostly for protective purposes ($n = 4$). Eyre's past teachers were protected most (3 times) within anecdotes of how they were unsuccessful in teaching her mathematics: "I'm sure these people were great, and *I have you know in elementary school these people also taught me other subjects and they were great in those subjects*, but in math it just never seemed to really draw connects" (Eyre, Int. 1). By protecting her past teachers, it is possible Eyre was defending herself from being perceived as disrespecting the profession she looked to be a part of. It is also conceivable Eyre was uncomfortable criticising teachers because of her current position in her teacher education program. Eyre's defensive moves focused mostly on her relationship with mathematics. Eyre defended herself by recognising her current position in relation to mathematics as a negative one: "I feel like I've kind of abandoned math, *that's bad*." In anticipation of the rational other criticising Eyre's abandoning of mathematics, she acknowledged her negative position. She defended her reputation as a prospective teacher because her anticipatory statement gave the impression of the possibility of a change in position. Eyre restated this claim and defended her projective identity in the same manner.

Discussion

Exploring Eyre's argumentation provided a glimpse into the projective identity she desired to have recognised by the rational other (Gee, 2001) as she began her teacher education program. Through Eyre's claims, there was evidence of four central components she valued as a prospective teacher: equitable practices, student engagement, application and connections in mathematics, and developing students' critical-thinking capabilities. If one's identity is the framework one uses to make sense of one's practice (Peressini et al., 2004), then these central components would be the framework Eyre used to evaluate what she was learning in her teacher education courses. Eyre interpreted what she was learning in her teacher education program as fitting into her projective identity (Gee, 2003). Eyre's use of evidence to justify her projective identity was partly through the use of narratives. This aligns with the idea of Eyre's identity being constructed of stories (Drake et al., 2001; Sfard & Prusak, 2005). Eyre's use of narratives also backs up Lutovac and Kaasila's (2014) construct of identity work as helping prospective teachers rewrite their narratives of self. Most of her evidence was based on beliefs. Eyre's use of beliefs in preference to narratives may be further evidence of the mushfake Discourse she used. She made claims about the work of a teacher-of-mathematics but distanced herself as well. Finally, her use of anticipatory statements provided insight into Eyre's ways of developing her argument as she continued the interview. These techniques used to argue her projective identity are important to consider the ways prospective teachers may self-repair their talk of future selves.

Overall Eyre's argumentation showed her attempts to use the Discourse of an educator and be recognised as a teacher. She talked about her role as a teacher, the environment she would like to construct, and her goals for students' learning. Eyre looked at her teacher education program to expand on her understanding of these aspects of teaching. She wanted to move beyond a mushfake Discourse influenced by her background and her experiences working with children to a Discourse convincing those who are members of her own membership. Her mushfake Discourse did allow her to make claims about her projective identity as a teacher. Some of Eyre's claims did not use I-statements. This avoidance of I-statements can be suggestive of her mushfake Discourse because it is possible she knows these are claims she is supposed to make as a teacher but may not yet believe them herself. Eyre did not attempt to explicitly be recognised as a teacher of mathematics in her argumentation. Aspects of her projective identity as a mathematics teacher were shared but Eyre, from the evidence provided, was more concerned with being recognised as an elementary teacher in general. Considering prospective teachers enter teacher education programs to receive the title of elementary teacher, it seems reasonable they would primarily be concerned with being recognised as such. Prospective teachers may not see the value of being recognised as an elementary mathematics teacher. Mathematics teacher educators may need to consider how to demonstrate the importance of the identity of an elementary mathematics teacher within their elementary teacher identity or help the prospective teachers in seeing the fragments of their larger identity as a teacher.

Eyre's preference for being recognised as a teacher over a mathematics teacher could also be seen because most of Eyre's claims were about her being a teacher in general and not specific to mathematics teaching and learning. I believe Eyre had not yet come to see the complexities of teaching mathematics because she was only starting her teacher education program and, consequently, had not done the identity work necessary to fragment her identity as an elementary teacher to more content-specific identities. The fragmentation of a general teacher identity to more content-specific identities is an important part of a teacher education program. The interventions teacher educators design can provide prospective teachers the space needed to fragment. Lutovac and Kaasila (2011, 2014) described interventions mathematics teacher

educators can utilise for prospective teachers (bibliotherapy, narrative rehabilitation, and other identity work). Furthermore, Gee (2012) recommended schools allow students to struggle with different Discourses. "Schools ought to allow students to juxtapose diverse Discourses to each other so that they can understand them at a meta-level through a more encompassing language of reflection" (p. 215). Prospective teachers should be asked to reflect on the way they wish to be seen as a teacher-of-mathematics. These considerations can be expanded on as the semester progresses and the prospective teachers learn more and more about teaching and learning mathematics. Prospective teachers should keep track of the changes in beliefs and perspective as they go through their teacher education program.

Mathematics teacher educators need to consider the ways prospective teachers wish to be recognised. Working within these identity spaces, mathematics teacher educators can intervene more powerfully in the trajectories of prospective teachers. I argue mathematics teacher educators need to position themselves as Discourse brokers. There is a Discourse involved with being a mathematics teacher. NCTM (2014) has helped in defining this Discourse and what it means to be a productive mathematics teacher. Helping students explore, understand, and make sense of mathematics teacher Discourse is the objective of a mathematics teacher educator as a Discourse broker. This positioning is a different lens on mathematics teacher education, and the argumentation of a projective identity is a start in seeing the benefits of this perspective. Future research should consider this position as a Discourse broker and ways to improve the juxtaposition of Discourses in the mathematics classroom.

Conclusion

The identity work prospective teachers participate in can provide a snapshot of their developing identity as teachers-of-mathematics and what the prospective teachers value in their education. For teacher educators, being able to identify the central components of a preservice teacher's identity as a teacher-of-mathematics can be useful for constructing a more relevant and responsive curriculum. Teacher educators who are aware of the discursive acts of identity work can also help students acquire the Discourse of educators they desire. Argumentation proved to be a useful method for investigating the projected front of a prospective teacher. Further teasing out of the warrants, backings, and other argument components (Toulmin, 2003) could provide further understandings of the ways prospective teachers attempt to convince the rational other of their projective identities. Additionally, by foregrounding the social (external) aspect of identity formation, a more complex portrait of the individual emerges.

Acknowledgment

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Author

Carlos Nicolas Gomez
Clemson University
email: Carlos@clemson.edu