

Chapter 11

Understanding Science Teacher Identity Development within the Figured Worlds of Schools



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Individuals carry with them diverse beliefs and values about teachers and about teaching into their certification programs (Lortie, 1975; Pajares, 1993), and these serve as filters on the curriculum, learning opportunities (including those situated in the community and in schools), and practice-based expectations they encounter during their preparation for a career in education (Richmond et al., 2011; Sford & Prusak, 2005). This is the case whether or not the candidate is aware of such beliefs or values (e.g., Schussler et al., 2010) or of the ways they respond either in word or action in the moment or even in the longer term. Some of these representations and encounters may be in alignment with a candidate's values and some may not be, and the extent of alignment may result in a level of consonance—often expressed as confidence, ease, and openness as opposed dissonance, expressed frequently as uncertainty, frustration, and resistance as teacher candidates move through the certification landscape (see, for example, Smagorinsky et al., 2004).

11.1 Challenges for Teachers and Teacher Educators

This experience of consonance or dissonance does not end once certification is gained, but rather moves with the individual as they take on the set of responsibilities expected of a full-time teacher. A beginning teacher who holds values which are in alignment with those that are hallmarks of her certification program may experience dissonance as a result of the sociocultural or sociopolitical climate of the school in which they work or the interactions they have with others in this space (e.g., Wray & Richmond, 2018). An example of dissonance would be experienced

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by a teacher who values instruction responsive to students' needs and their ability to engage fully in scientific practices to develop deep scientific understanding who then finds herself a member of a science department in which teachers are expected not only to implement instructional plans which are didactic in orientation, but to do so in lock-step with one another. In such a scenario, teachers have no freedom to change the content or pace of their instruction in response to any difficulties noted in students' understanding, in the face of unexpected questions or observations, or in pursuit of the goal of handing over increasing responsibility for the learning process to the students themselves.

Not surprisingly, challenges also present themselves to those who help to prepare individuals for the teaching workforce. Teacher educators are enactors of curriculum, supervisors of field-based work, and gatekeepers to successful program completion. Any one of these is a complex role to play, but in many cases, a teacher educator serves in more than one capacity, and it becomes difficult to be an advocate of the program and of the individuals moving through it while at the same time a liaison with mentor teachers, whose own values may or may not be in alignment with those espoused by the program and held by the candidate whom they are mentoring.

11.2 Identity as a Grounding Construct

Being able to name some of the features of identity—as static or dynamic, physical, sociocultural or sociopolitical—is only the beginning of designing strategies to address the problem of teacher frustration and dissatisfaction, either or both of which can lead to a departure from the classroom. A solution can only be reached if we better understand several things about teachers: what factors or events exert “pushes and pulls” on them, especially early in their careers; how they perceive elements of the worlds they inhabit; and what specific actions they take in response to these perceptions and to their place in that world as they understand it.

For many decades the construct of identity has been invoked in a variety of situations while also being the focus of debate amongst psychologists and sociologists; in more recent years, it has been “borrowed” by educational researchers as a theoretical lens through which to better understand not only the willingness of individuals to take on certain roles and engage in particular practices, but also and more broadly, the ease with which individuals enter and persist in teaching careers. Views about how identity is constructed have historically had either cognitive or sociocultural roots; in the former perspective, identity has been treated as being relatively stable and shaped by internal forces, while scholars in the sociocultural tradition view identity as situationally dependent, as well as dynamically shaped by features and events in the context in which the individual lives and works (for a brief review of these two approaches to understanding identity and its development, see

Richmond, 2015). One specific sociocultural variant is that of professional or teacher identity, which has become a useful tool for our developing understanding of the construct as it unfolds for classroom educators.

Even if we were to agree that a sociocultural view of professional identity is most helpful in understanding how teachers react to the constant challenges they face in these professional roles, it has proved to be a complex problem which, not surprisingly, has been addressed in diverse ways by scholars (e.g., Chu, 2020; Cobb et al., 2018). In fact, the entries in this volume are an excellent reflection of this diversity of perspectives and framings.

Historically, there has been little “cross-talk” among the multiple theoretical frameworks proposed for the study of teacher identity development, but more recently, several researchers have proposed that a more fruitful approach would be to explore how multiple perspectives might be employed to gain a deeper understanding of this complex process. The work of Varghese and her colleagues is an excellent example of the insights that can be gained and challenges that can be identified through the integration of multiple perspectives (e.g., Varghese et al., 2005; Varghese, 2016). These scholars recognize that identity is a complex construct which is described in various ways by different frameworks. Rather than pit those frameworks against one another, they sought to deepen their understanding of identity by using the strengths of one frame to address the weaknesses of another across disciplines. They argue that there are elements of each framework that are generative and that only through multiple frameworks, such as situated learning, image text, and social identity theory, can a composite framework be created with greater explanatory power. Due to the complexity of identity in multiple contexts, only by considering multiple frameworks can this complexity be maintained and better understood.

We have taken this to heart in the work we have done with those preparing for careers in science teaching, as well as with those who are in the early years of their teaching careers. In some research in this construct domain, agency (which we define more fully in the section which follows) has been considered a second cousin, theoretically speaking, to identity, and the ways in which an individual positions herself with respect to others inhabiting the same community as well as the context itself have only rarely been invoked as factors in shaping this process. In contrast, however, the first author’s earlier work on teacher identity told a different story (e.g., Richmond & Muirhead, 2014). That research has served as a foundation for a set of investigations in which the goal has been to understand more deeply the interplay of agency and identity development and how these are shaped by particular and dynamic features of the context (both physical and cultural) in which individuals find themselves by choice or by circumstance. Articulating this relationship has been an intriguing professional and intellectual challenge, and it is to this process of articulation (as aligned with the first and third of our goals for this chapter) that we turn for much of the remainder of this chapter.

11.3 Investigating the Professional Identity of First Year Teachers

Building upon Richmond's prior work, we focused our early studies on the relationship between agency and identity of early-career teachers (Wray & Richmond, 2018). In completing this work, we created a model in which we drew on Bandura's (2001) sociocognitive view of agency, which is centered on intentional acts designed to have a specific outcome, with the sociocultural views of Wertsch et al. (1993), which ground the development of agency as an outgrowth of social interactions individuals and groups have with each other. While both views provide individuals the means to act with intent, together they provide a richer sense of the territory traversed in the development of agency. Bandura's (2001) sociocognitive approach, for example, does not account for the role of the environment in supporting or pushing against agentic action, while Wertsch et al. (1993) sociocultural approach relies heavily on tools available within a particular context to support agency. Additionally, the latter scholars limit agency to the tools immediately available and do not acknowledge a person's past experiences in other contexts as influential in decision-making while this is accounted for in Bandura's (2001) work. It is by assessing elements from these two views of agency that we were able to create a more complete view of action that takes into account the context in which decisions about such actions take place. Figure 11.1 represents our initial model for teacher identity which takes such consideration into account.

In our early framing, we considered professional identity to be the expression of two components: positioning and values. The first of these includes how the teacher positions themselves and is also positioned by others in the community they inhabit (e.g., Arvaja, 2016). The second component—values—includes those ideas, goals, or priorities that drive an individual's actions – or a community's actions, for that matter (Richmond et al., 2011). It is worth noting that while every teacher possesses a set of values, those values will not necessarily be prioritized if the context or community does not support actions that align with these values, and it is here that agency is critical; more specifically, in their immediate teaching environment, purposeful action is the result of a teacher recognizing a challenge, developing a plan to address that challenge, and putting that specific plan into action. For the purposes of this study, we saw writing about or speaking about a challenge as *recognition* of that particular challenge. Engaging in actions that align with an individual's values and experiencing some level of success as a result makes it more likely that similarly purposeful actions are subsequently engaged in, that agency develops, and that those initial values continue to be reinforced. When we say "success", what we mean is the outcome of the action is what was intended when it was planned.

Our analyses of classroom observations, journal entries, e-mail correspondence, and interviews allowed us to make claims about these teachers' identities and agency based on what they did, wrote and said and which reflected their primary values, the ways they were positioned by themselves and by others, and the actions they took which were related to those views. Below we share some data to illustrate

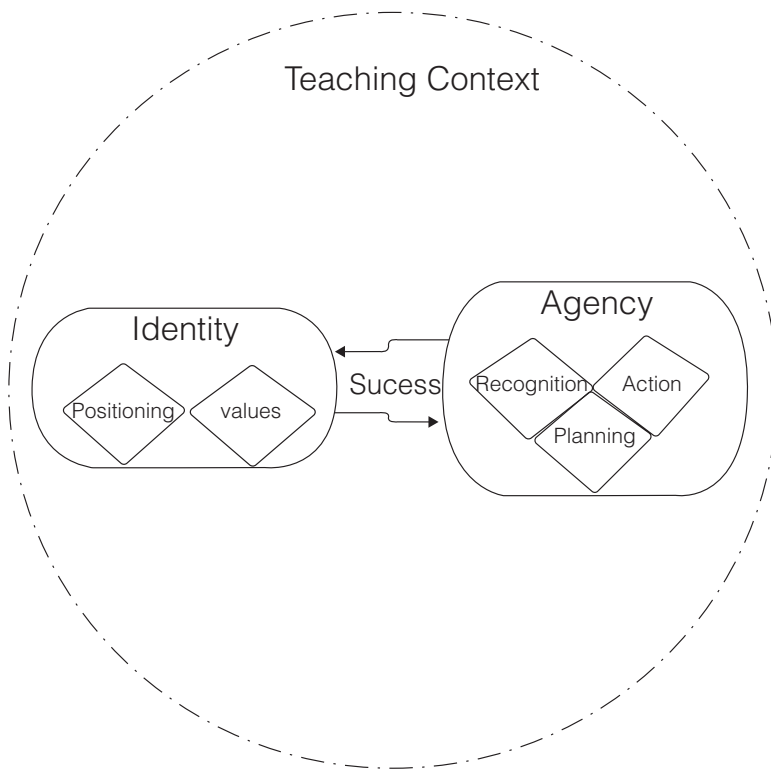


Fig. 11.1 Feedback loop of identity and agency in Pre-service and In-service teaching

the components of our initial model, their relationship, and some issues left unresolved by our analyses.

During her first year of teaching, Nina, one of our participants, repeatedly focused her writing, her talk and her efforts on “... facilitating discussion where students are interacting with each other and not just with me” (Journal, 10/2014). Evidence of this as a core value was reinforced by her referencing the support she felt from the administration and the freedom she had to focus her efforts on developing skills to advance this goal. In an email to Author 2, she stated “... I am still figuring out how to best facilitate small group discussion that is productive and scientific... I want to find a way to encourage students’ independence and make them feel confident enough to conduct a conversation with their classmates. I am starting by providing discussion questions for them and having them write their answers on white boards so that we can talk about it as a class” (Journal, 10/2015). In addition to valuing scientific discussion, Nina was positioned by other educators and acted in a way that supported her work in ways that reflected this value. What we were unable to ascertain through our multiple analyses was why she felt a sense of agency, what role the social and physical context as well as other individuals with

whom she interacted played in influencing her pedagogical decisions, and the extent of alignment between her choices and those of others around her.

In contrast, as a first-year teacher, William found himself on the other end of the spectrum in regard to support, stating, "...I do sometimes feel like I'm left all alone. And that's not a good feeling; it's kind of scary" (Interview, 1/2016). William's background and experiences in the teacher preparation program informed his primary value of having the students engage in inquiry in a relatively authentic way. However, the lack of support he felt in his school stifled his ability to work toward this goal. During an interview William stated: "I am told to teach microbiology... I've been promised a certain amount of money for this but [the school district] is notorious for not coming through with anything at any point ... I am expected to teach high-inquiry science classes but I can't even get paper" (Interview, 6/2016).

Recognizing what little influence he had to get the materials he was promised, William turned his attention to the students as a reason for and potential solution to his inability to teach how he felt was best. William saw what he considered his professional behavior as restricting his ability to gain the respect he felt was necessary to get compliance from the students. "... When I got here, I realized ... When you try to be something you're not, these kids can see right through it ... they won't trust you, they won't respect you, and they certainly won't do what you tell them to" (Interview, 6/2016). He felt that by behaving in what he perceived was a more natural way, by being more sarcastic rather than formal, the students' respect for him increased and as a result, so did their compliance.

Our analyses of data from these two participants, as well as other beginning science teachers graduating from the same program and working in diverse professional contexts, led us to increasingly wonder what it might be about the school itself which made the experiences different for each of these beginning educators and more importantly, how their interpretation of particular policies, cultural elements, and interactions might shape in some way actions they undertook as classroom educators. We knew that both agency and identity were informed by the school context, but our initial theoretical model did not provide us with access to the dynamic and often subtle ways in which such critical influences developed and often persisted. Having identified this limitation, we sought a way to retain what had proven invaluable as a tool for articulating the interplay between identity and agency but would also permit us to examine and better explain the role that the particular features of the world an individual navigated by privileging that individual's perceptions of the features of that world and retaining the world's inherent complexity.

The limitations of this model arise from the fact that schools are sociocultural institutions or "cultural worlds", and cultural worlds have particular meanings for those who inhabit them. The framework we developed did not account for the nature and dynamics of these worlds in any significant relational way. The limitations of the model all appeared to us to be centered on how decisions affecting action arise and what the consequences of this action are for the individual. That is, the framework, along with many others:

- (a) Does not address in any nuanced way, the role that individuals' perceptions of the world in which they work arise;
- (b) Does not account for actions taken by individuals as a result of these perceptions,
- (c) Does not account for the consequences that taking action has on developing agency and identity.

For example, in the third year of data collection and analysis in the larger project from which the data reported here originate, Nina, through her own actions, was positioned as a valued member of the community and as having increased power and privilege. She was asked to take the lead in developing new curricular pathways for science in the middle grades, a priority for the administration.

We recognized the need for a framework which would feature the interplay between physical, cultural and psychological aspects of the space inhabited by teachers whose decisions and whose lives we were trying to understand more deeply. We also needed a framework that would allow us to privilege teachers' narratives of their experiences. Fortunately, we found a theoretical perspective on identity construction proposed by a group of anthropologists which did just that and which informed our development of a "hybrid" model to guide our work and deepen our understanding about how teachers make decisions and navigate the worlds in which they work.

11.4 Figured Worlds as Identities-in-Practice

In 1998, a group of anthropologists, led by Dorothy Holland, introduced figured worlds as a way of viewing culture and culture-bound identity. These scholars used this framework to explore such identities as beauty in American universities, woman-ness in the caste system in India, and membership in Alcoholics Anonymous, among others. In all of the situations they explored, people enter what they term a "figured world" and make their way by engaging with specific communities within this world and by learning the expectations set forth by community members. It is in these worlds, they claim, that identities are developed and either pushed against or further supported in relation to expectations for action set forth by those within the world who possess relatively greater power (Holland et al., 1998).

Holland and her colleagues (1998) claimed that figured worlds are, by definition, the social and cultural spaces within which people engage in actions in relation to a set of expectations established by the other actors in that world. These worlds are also the space within which identity is developed and refined *in practice*, that is, through perceptions and consequent actions that take place within a particular community. In order to explore how identities are formed through these actions and how those actions are perceived by other members of the community, they identified four features of a figured world—culture, artifacts, community, and power and privilege. In Table 11.1 below, we briefly summarize these four features.

Table 11.1 Features of a figured world

Feature	Summary
Culture	<p>From Holland et al. (1998, p. 54): “The meaning of characters, acts, and events in everyday life was figured against this storyline”</p> <p>In other words...</p> <p>Standard plot of the world against which lived experiences are compared</p> <p>Reflective of the values privileged by those with more power and privilege</p> <p>Can be modified by actions of people participating in the storyline, not necessarily those with greatest power & privilege</p> <p>For example: A school-wide focus on assessment or developing school/home relationships</p>
Artifacts	<p>From Holland et al. (1998, p. 61): “Figured worlds are evinced in practice through the artifacts employed by people in their performances... they are the means by which figured worlds are evoked, collectively developed, individually learned, and made socially and personally powerful”</p> <p>In other words...</p> <p>Physical and discourse-based tools used by participants in a figured world</p> <p>Tools used in actions of those participating within a figured world</p> <p>Include titles and labels given to people that have been historically built and come with required expectations</p> <p>For example: Common departmental assessments or grade-level curriculum</p>
Community	<p>From Holland et al. (1998, p. 192): “...Identity responds to both the imaginary and the embodied communities in which we live”</p> <p>In other words...</p> <p>Social and cultural groups that use artifacts. These groups are characterized by a power dynamic that exists among its members in which certain actions are valued over others</p> <p>Membership in the community is socially developed, and practices or activities take place in historical time.</p> <p>For example: Subject matter departments, specific school committees</p>
Power & Privilege	<p>From Holland et al. (1998, p. 60): “...Gain perspective on such practices and come to identify themselves as actors of more or less influence, more or less privilege, and more or less power in these worlds”</p> <p>In other words...</p> <p>People and actions are compared to one another, naturally ranking them.</p> <p>Being new does not often afford power and privilege, but they can be gained through agentic action in culturally acceptable ways.</p> <p>For example: Differential status among teachers within a school or department based upon years of teaching experience, subjects taught, student populations taught</p>

Holland et al. (1998)

A figured world can be viewed as a space in which an identity is, in part, recognized and developed through the actions in which someone chooses to engage. By participating in activities within a figured world, individuals come to see themselves as participants and can then position themselves as having more or less privilege and power relative to others. Not only does participating in certain practices help a teacher place themselves within the world, but assigning meaning to those practices relative to the “...norms, practices, values, and demands of the setting...” (Carlone et al., 2014) may in turn change their value. It is thus an “identity-in-practice”. Our

experience in analyzing our accumulated findings is that figured worlds, in conjunction with our earlier model of professional identity are powerful lenses which allow us to more effectively accomplish several goals: to represent the dynamic and “self”-centered process by which individuals accumulate perceptions of each of the multiple worlds they inhabit as well as of their place in these worlds; to consider these perceptions alongside what they value most; and to make decisions about what to do and how to align themselves with others as an outcome of these perceptions. Together they provide powerful insights on the development and refinement of professional identity. In the next section, we describe how we brought these two framings together to create a “hybrid” model which we used to analyze and interpret data from our beginning science teachers.

11.5 A Hybrid Framework for Understanding the Development of Teacher Identity

In more recent investigations we have elaborated on our ideas by focusing more explicitly on the “context” in which the teachers work. We continued to draw upon Richmond and her colleagues’ earlier conceptualizations of identity, which include values and positioning at their core (Richmond & Muirhead, 2014; Richmond et al., 2010; Richmond & Wray, 2017; Wray & Richmond, 2018). We married these views with those of Holland et al. (1998) and Carlone et al. (2014) about figured worlds. The result of this synthesis is the model which can be seen in Fig. 11.2. This “hybrid” model brings these views together in what we consider to be a more powerful accounting of the dynamic processes underlying identity development and refinement, one which is positioned with respect to the individual teacher’s own perceptions and actions within the figured world they inhabit. In this framework, the four elements of figured worlds – power, culture, community, and artifact – work in concert with the perceptions, actions, positioning, and agency as the grounding for the development of identity. In this model, agency still plays a central role in the development and refinement of science teacher professional identity. Actions that have successful outcomes for students and for the teacher, where these outcomes can be in the cognitive, social, or affective domains and where these outcomes are recognized by those possessing more power and privilege, allow values to continue to be reinforced, agency to grow and the continued successful identity development possible.

An example of this relationship for teachers might be the enactment of an activity sequence for a unit of instruction in which prior students have experienced significant challenges. When such enactment results in greater student engagement and achievement, the teacher feels greater is recognized by more senior colleagues in the department as something they would like to adopt in their own instruction. This success may even reach the “ears” of administrators, who in turn may add their encouragement to the teacher. The positive reactions by both students and colleagues in turn encourage the teacher to engage in similar instructional innovation moving forward.

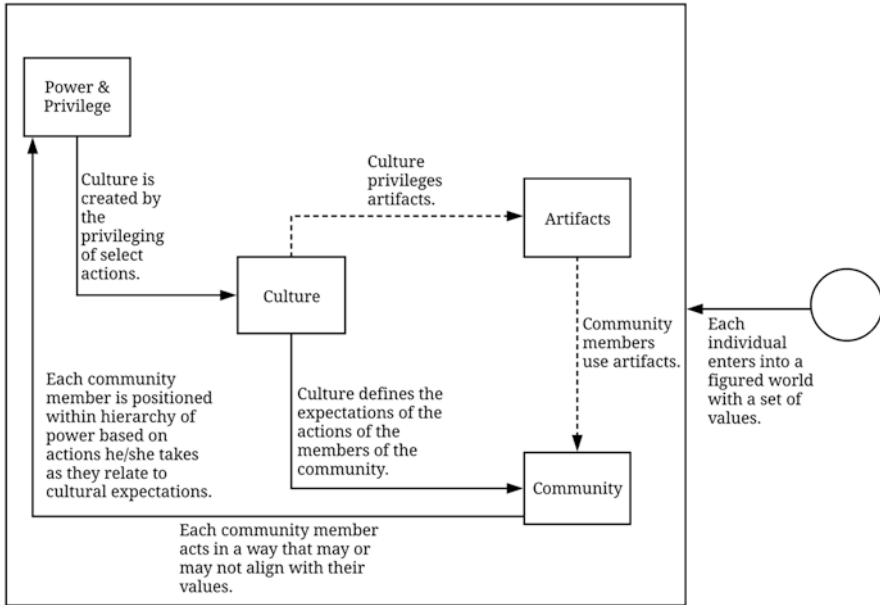


Fig. 11.2 Model of identity development through a figured worlds lens

11.6 Using the Hybrid Model as a Lens on Beginning Teacher Identity Development

We accessed the larger pool of data we had collected from a cohort of educators that extended from their final year of their teacher certification program through their first year of teaching. Using this framework, we leveraged teacher narrative (Richmond et al., 2011), focusing on journal entries, email correspondence, and interviews as our primary data sources. By drawing on written and oral narratives, we were able to develop stories which revealed features of the figured worlds as experienced by the teachers themselves. More specifically, we approached the data using inductive case-based methodology (Glesne & Webb, 1993), modified inductive constant-comparative method (Corbin & Strauss, 2008; Dyson & Genishi, 2005), and by writing analytical memos (e.g., Maxwell, 1996, 2008). The data were initially analyzed for broad themes of identity (values based on recurring themes and positioning in reference to placing or being placed in relation to others) and features of the figured world (Holland, et al., 1998) in which the teachers worked. Data were then re-analyzed for evidence of held values and patterns in prioritized values, instances of positioning, recognition of specific challenges, the identified and pursued solutions and, as applicable, post-action reflections. For each data source, patterns were coded for: primary *values* (the value or issue of most importance), *positioning* (references to interactions with individuals and communities), *agency* (recognizing an issue, planning a solution, and implementing a plan around

that issue), and the *figured world* (with specific coding for elements of culture, artifacts, community, and power). Coding was done for teaching-related issues (e.g., teaching practices, relationships, school priorities) focused on by participants and references to interactions and conversations with and about others. References to problems participants had been experiencing (e.g., students not complying with directives, dissociation from the school community) and how this problem may or may not have impacted actionable decisions also was noted. Continued repeated mention of problems or challenges were used to indicate level of priority. Further analysis resulted in more specific codes (i.e., student engagement in science, relationships, respect), which was utilized in a second round of coding. Patterns of codes were then used to draw comparisons *between* cases. Video excerpts were chosen based on what stood out as related to references in journal entries, what was based on submitted lesson plans, and what was relevant to the framework. Lastly, data were triangulated across sources and used to create a more complete profile of each school world and each teacher's professional identity as it developed within it.

Below we briefly present selected data exemplifying three of the four elements of figured worlds as Nina and William experienced them. (Given the participant-generated nature of the data sources to which we had access, our ability to identify significant numbers of artifacts across sources was limited. As a result, we chose to omit treatment of this fourth element from the analyses reported here).

11.6.1 *Nina*

Nina came to teaching after completing a bachelor's degree in zoology and working for several years as a zookeeper. Having interacted with the public in an educational fashion as part of her duties with the zoo, she came to the teacher preparation program poised to learn how to teach. What she seemed to value in regard to teaching practices in her first year indicated to us that her views of teaching aligned with those of the preparation program. She was then able to carry what she learned and valued into her first year of teaching.

Culture Nina began her teaching career in a public charter school that was housed on the campus of a small university. A charter school in the U.S. is a public school which is created by a group of individuals to meet a perceived need or fill a specific purpose. While it typically has its own independent governing board, it receives public funding in the same way that non-charter public schools do. Several resources made available by this association could be leveraged by the school, including, for example, access to science lab space and equipment and the opportunity for older students to dually enroll in courses and thus earn university credit. However, the school was at the mercy of the university schedule, which limited time and access to classroom and lab space. As a public charter school, its continued existence was dependent upon sufficient student enrollment, and enrollment was a priority for school leaders. It also contributed significantly to Nina's perceptions of what was

judged as important in her school's culture (the storyline) and shaped her actions in response to these perceptions. However, the administration generally supported teachers in developing individualized professional growth plans and working with these goals in mind.

I think because they are really supportive and I think that if like [department chair] and [principal/president] are really supportive of that and like even when [department chair] and I disagree on something like we'll have a discussion about it, but it usually comes down to like it's not a bad thing so just try it. See how it works and I think because the school is brand new, there is still a lot of that, like, "try it to see if it works and if it doesn't work we'll try something different or we'll go back to what we had before." (Interview, 5/2016)

Not only was Nina new to teaching, but she was also in a relatively new school, and one which had as a priority the design and development of curricular pathways aligned with the performance expectations of the United States' new science standards recently adopted by the state (the Next Generation Science Standards or NGSS Lead States, 2013), as well as the expectations of the science courses of the university on whose campus the school resided, where it was located and with which it was partnered.

We are designing curriculum to challenge all levels of students and develop a variety of skills rather than teaching to any kind of test. We talk about not only supporting our lower students and bringing them up to par with their peers, but also how to create extensions and other opportunities that will challenge our high achieving students as well. Rather than being warned about students, I have heard so many teachers tell me how lucky I am that I will have the students that I have. (Journal, 10/2015)

Community Nina entered into a department of only three sixth- through eighth-grade science teachers, and her department chair was a graduate of the same teacher preparation program. Being a new school with a small science department, lesson designing and teaching were very much in the hands of the teachers. This posed both affordances and constraints; with respect to the former, for example, Nina was free to focus on the pedagogy that she valued and to teach in a way that aligned with her professional identity.

I really want to focus on developing solid curriculum this year and assessments to go along with the curriculum so that next year I am able to change and perfect the things that I have planned this year and begin adding in even more good stuff that can focus on writing and reading and really prepare students for college. I am really looking forward to working with [author 2] and [department chair] this year to develop some really good units, and I am also looking forward to them helping me to set reasonable goals for this first year. (Journal, 9/2015)

It was this recognition of the *challenge* of developing appropriate curriculum and assessments that contributed to the development of agency. Being a new teacher in a new setting, she also was relatively well supported by those with more power and privilege to reflect on and make changes to her teaching. Her department chair shared many of the values that she had regarding teaching secondary science.

I really like these meetings as it is a great opportunity to get answers to questions and to run ideas past [principal/president] that have more to do with the big picture and alignment with

the goals and ideals of the school. He provides a lot of really helpful feedback and encouragement. (Journal, 5/2016)

However, she followed this by sharing the dismay she felt when she was told by the principal that he was no longer going to be able to hold meetings with the teachers in this fashion, essentially removing the support she had grown to expect and appreciate. The pressures placed on the principal to focus on enrollment and recruitment became a priority over his mentorship of teachers.

Over time, Nina positioned herself as someone with leadership capacity in middle school curriculum and assessment. She took on the task of designing the middle-school (6th–eighth grade) science curriculum and was instrumental in co-designing with her department chairperson a performance-based rubric (planning) that was implemented with great success (action) and was not only adopted by the entire department, but also adapted for use in many other departments in the school. This combination of recognition, planning and action, increased Nina’s sense of agency. Additionally, her sense of ownership and innovation was instrumental in establishing her as an integral member of the school community and one who could be seen as a catalyst for change.

Power and Privilege Nina was able to develop a sense of power when positioned as the content leader for middle school science. The administration had a vision for the school including a priority to bolster admissions. Also, the department chair had a focus on developing curricular pathways that met the needs of the state standards and was aligned with the expectations of its community college partner. The two primary sources of power, the administration and the department chair, had different primary priorities but were in alignment with a secondary focus; one of supporting teacher development that was responsive to the needs of the individual teachers. This support and resulting freedom helped Nina act in an agentic way that aligned with what she valued. Feeling a sense of success in focusing on high-leverage practices and being recognized by those in power as being successful further confirmed that what she valued was also valued by the community. Additionally, as she acquired responsibility, she was able to work in a way that supported her own values as well as those of the department by aligning the curriculum she was developing with what she felt was good teaching.

I think that there are lots of things that I have the power to change in my teaching and school. I think the biggest freedom that I have is in my curriculum. There are really no stipulations or guidelines for what I have to create other than we need to follow NGSS. I really like having that freedom to create whatever I want to and to organize the content in whatever manner I feel is best for my students. (Journal, 2/2016)

This provided her with a sense of power that was further acknowledged when a performance based assessment rubric was adopted by multiple departments within the building.

So like each time I kind of vary the rubric that I use based on what worked and didn’t work the last time and so I tried to change my rubric so that I can be more explicit with what it is I’m looking for and communicate that with the kids so they are not surprised when they get

points off for things like that. So that is definitely one thing. And I've also been talking to the Social Studies and English because they do all similar kinds of projects that we do in Science so I ask them what rubrics do you use. Like can we use a common rubric that way they know in every class what a presentation is going to be graded by and we just put in the content parts later. (Interview, 5/2016)

Through the power she gained, Nina was able to make changes that were taken up by the school, thus re-shaping the storyline that conveyed the school's culture.

11.6.2 *William*

William decided to pursue a teaching career after having completed a PhD in microbiology. As a result, others had certain expectations of him within the school, and he had expectations of himself as well.

Culture William's first full-time teaching position was in a school in a large urban district in the midst of major upheaval. Due to repeated poor student performance on state-mandated standardized tests, the school was placed under management by an entity directly controlled by the state department of education, and new school leadership was appointed. With this change in leadership came an emphasis on factors that were identified as critical in influencing test scores: school attendance, critical thinking, and reading level. These all too often constitute the storyline of many under-resourced school cultures, and William's school was no different. William stated: "...I am ostensibly a biology teacher but I work in an environment where the ultimate goal that I have for my students is not necessarily to learn biology, but how to look critically at the world" (Journal, 2/2016). While William felt these factors were important, he also felt the execution of plans to create a school culture in response to these factors was making it difficult for him to teach effectively. During an interview he stated: "But the school as a cultural thing you know, we really lack a solid vision as a school, we are working on it....my expectations for my students are not matched by the administration's willingness to hold them accountable for those standards..." (5/2016). William felt that the mission of the school and the ideas privileged by its administrators aligned somewhat with his own views of good teaching and there were indications he may have believed he could achieve his goals of providing students with "hands-on experiences" (Journal, 2/2016), but the upheaval in leadership led to a lack of support, leaving him feeling severely under-supported.

The following year William gained employment in a school within the same district where students had a history of success on standardized exams. A clear vision of the school's vision and priorities was evident in his reflections, as when, early in the year, he wrote: "Even when disciplinary actions are taken both the parents and staff are right with you" (Journal, 8/2016).

Community During an interview in January of his first year William mentioned assisting with robotics club and the benefits that potentially affords. He began by discussing that the robotics students are in the twelfth grade and he mostly taught ninth and tenth grade students. But what stands out is when he went on to state "... it's been not only helpful for that [relationship building with students] but because it helps me interact with the staff... I can go two or three days without seeing some of the teachers" (1/2016). Additionally, William came in as a junior member of a science department of two, and shortly after he arrived, the other teacher was pulled into an administrative role, leaving his own classroom with a long-term substitute. When challenges arose for the substitute, planning and student management duties fell to William.

On the rare occasion William was able to interact with a community of teachers, mostly during professional development, the interactions were unhelpful from his perspective.

So we got teachers that have been there [school 1] for three to four years who I hear side conversations that they're not really adapting to changes, they are not really trying to engage their practice. And I think that hurts the ability for me to set up my learning environment because I am trying to adapt to the changes, I'm trying to do the best I can for my students and they know that. (Interview, 1/2016)

Changing schools in his second year afforded William entry into a new community with a culture which was well established and which had the capacity to provide a set of supports for new teachers which were aligned with his needs. Early in the second year William reflected: "The staff and administration have been amazing about answering questions and helping me get used to the new environment" (Journal, 8/2016).

Power and Privilege

The environment of William's first school presented many challenges. He entered teaching with views reflecting those of his preparation program including that of providing students with hands-on inquiry. He knew that he was coming into a space that was being reorganized for poor student performance. However, because of the state's impending take-over, William had little power to pursue what he valued most about science teaching and learning. He also felt vastly under-supported while also feeling immense pressure to help his students to improve. He stated: "...I am dealing with them [administrators] and they're, like, we do what we have to do... we will support you, but then when it comes to the practice there's not the resources there to make it happen" (Interview, 1/2016). Similar comments appeared repeatedly in his journal entries and in interviews. The extreme nature of his situation came out in an interview where he stated: "Sometimes it is like a battle for survival where I'm trying not to compromise my principles, but I still want to make it through the day alive" (Interview, 1/2016).

The transition to a new school in Year 2 was helpful, but not without its challenges. For example, being the junior member of the department meant he did not have his own classroom. “I’m struggling with how best to offer laboratory-related items while roving on a cart... labs can run multiple days or weeks, and I don’t have a ready place to set them up and leave it.” (Journal, 8/2016). William’s *recognition* of his need to provide students with hands-on experiences continued to be challenged, but in different ways. In the first school he was not supported in teaching aligned with his expressed values because of a lack of a community with shared values, insufficient resources, among other factors. In the second school, however, a shared value for teaching science in this way and a larger community more experienced at providing students with explorative learning opportunities allowed him to pursue what he valued, despite large class size, a continued lack of resources, and pressure for higher student performance on standardized tests.

Changing schools meant that William had to navigate a new figured world, sorting out how to work in ways that allowed him to align with that world and teach in ways that respected his values and permitted his continued professional growth. Upon further reflection about his first year of teaching, William found several positives.

Generally, things are going very well. In many ways, this is like ‘year 1, part 2’, because the environment has been so different for me in terms of teaching practice, environment, and student interaction. If anything, I do have to thank [school 1] for very quickly getting me into a place where I am not willing to tolerate shenanigans from my students. You definitely did learn about management. I believe I can be fair, but that also means establishing and enforcing my role as an adult in the room. Despite what happens “in the moment” when I am forced to do this, it seems that students ultimately respect teachers who hold them accountable. (Journal, 8/2016)

The teachers in this study entered into unique figured worlds, each of which had different but relatively established cultures. The teachers and staff participating in each of these worlds generally worked in ways that were aligned with administrative expectations, and the first-year teachers had to find ways to position themselves with respect to that figured world’s cultural storyline. More experienced teachers generally did their part to provide support for newcomers. In some cases these supports were in opposition to administrative mandates and reflected what veteran teachers valued at that point in time.

Having power and privilege within one figured world does not predict power and privilege in another. Being new generally translates into low levels of power and privilege, and navigating interactions with multiple, often overlapping communities means having to be thoughtful and often strategic about their actions because working in the service of the goals of one world has the potential to push one out of alignment with the goals of another, and this impacts the acquisition of power and privilege in both worlds.

11.7 Implications for Understanding Professional Identity Development and for Supporting Early-Career Science Teachers

This hybrid model has allowed us to uncover the ways in which novice science teachers implement practices within their school contexts. It also has provided us with a sense of what supports might be helpful for preparing teachers to engage in progressive practices (Wray & Richmond, 2018). Ultimately, school communities and school culture more broadly weighed heavily in shaping pedagogical decisions made by the teachers we studied, something rarely addressed within teacher preparation programs and which is even more challenging to address through the typical, largely generic professional supports offered by schools and districts to teachers in the early years of their careers. These observations informed our investigation of school-embedded factors that were most salient in affecting teaching decisions. Our resulting model has been a rich and informative lens through which we have been able to begin articulating how we might not only understand critical elements, perceptions and actions within the figured worlds in which teachers work, but also to consider the means by which we as science teacher educators might better prepare and support early-career science teachers by being responsive to these.

More specifically, there are some activities or features teacher educators can incorporate into methods courses, field experiences, and even as part of induction support, inclusive of professional development efforts. This starts with providing opportunities for teacher candidates and teachers to explicitly name or claim what it is that they value and to explore how it is these values developed—what prior experiences and what individuals, for example, shaped these views about what is important to them personally and professionally. Recent research making use of critical autoethnographic narrative (e.g., Lavina & Lawson, 2019; Yazan, 2019) is promising in this regard.

Using this approach, science teacher educators can provide experiences which allow candidates and beginning teachers to reflect on what is it about the worlds within which they are learning and working and the features within these worlds that align or do not align with those advocated by their preparation and professional support programs. At the same time, experiences might be orchestrated to help teachers develop strategies for gaining expertise aligned with what they value and which can at the same time provide them with a sense of power in the hierarchy which characterize such worlds. If such strategies can also bring into alignment the values of the teacher with those embedded in the school culture, then tensions can be reduced for the individual while a greater sense of agency can develop. An example of this occurred when the rubrics Nina created were taken up by teachers, not only in science, but in other departments in her school.

Agency is an individually developed construct. But power and privilege are gained when an individual is recognized by others as being a leader or expert in some way which is valued by the community. A teacher can be agentic and work in a way they value and yet not gain power and privilege due to the lack of recognition

by others. But should others recognize agentic actions and view those actions as aligned with the culture of the figured world they occupy, the teacher may be positioned differently within that figured world. Recognition of what particular actions offer both to the individual and to the school culture contribute to continued and productive professional identity development. Such recognition and upward shifts in power and privilege may also contribute to increased teacher retention, as several of the leading causes of teacher attrition include a sense of powerlessness and a lack of recognition and belonging (Kelchtermans, 2017).

Another aspect of this model that can inform the preparation and support of beginning science teachers is a recognition by teacher educators and professional development providers of what features of these worlds are perceived by teachers to be most important. Such knowledge can be used to help teachers negotiate how best to position themselves with others in the community within the figured world they inhabit while staying true to their professional identity and thus “figure” their place within that world. Acknowledging that both teacher candidates and beginning teachers are entering into spaces that by virtue of the elements that characterize them may align with or operate in opposition to practices that are featured in the preparation program they attended and/or those that are held by the teacher is essential. Actively seeking to discover the primary values of the culture and community the teacher is working in can provide insight into the tensions and therefore potential avenues for agentic action to push against or navigate through the established narrative of a figured world which features prominently in that teacher’s life. Similarly, teacher educators can provide guidance to the teachers to be reflective of their practices and to examine reasons those practices are being implemented with fidelity or are posing challenges to enactment. As previously mentioned, if a teacher can gain an awareness of the features of the world that are working in opposition to their pedagogical choices (as well as those which are aligned), solutions can be developed in concert with teacher educators (or with supportive others, including peers and possibly even other professionals within that figured world) to allow the teacher to find success in a way that supports their progressive teaching choices and feelings of agency while also working in parallel with the value of the culture and community of the teaching figured world.

The figured world lens has allowed us to refine our model of teacher identity development in ways which allow us as science education researchers and as teacher educators to gain access to the teaching space our preservice and early-career teachers enter and to understand better how their perceptions guide the way they traverse these spaces. In turn, this allows us the potential for assisting these beginning educators in developing a strong professional identity foundational for continued agentic action in the service of their students’ learning. It is through the actions that these beginning educators take that those with more influence in that figured world can begin to recognize novices’ expertise and these educators can garner a sense of power and privilege while contributing to the world of which they are a part. This is a critical point because in the research literature, we generally tend to underestimate the potential for novice science teachers to effect change – even reform. And at the same time these teachers are changing their status in the hierarchy of their figured

world, they have greater potential to contribute to deeper and more consequential learning of the students they have responsibility for educating.

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