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Chapter 13

Elementary Science Teacher Identity as a Lived Experience: Small Stories in Narrative Analysis

Lucy Avraamidou

Identity and how it develops has been of interest for a few decades now in various fields of studies, such as education, philosophy, psychology, sociology and anthropology (e.g., Gee, 2000; Moore, 2008; Stets & Burke, 2000). Broadly summarized, identity has been used to refer to the characteristics of *Self*: who someone is and the ways in which she/he presents her/him-self in everyday life (Goffman, 1956). In identity theory, the core of an identity is the categorization of the self as an occupant of a role, and the incorporation, into the self, of the meanings and expectations associated with that role and its performance (Stets & Burke, 2000). In this study occupant role is seen as the role of a science person meaning someone who can self-identify with science and engage in scientific practice and scientific discourse.

The construct of identity is greatly important especially when studying women's engagement with science (as in this study) given that identity offers itself as a tool for examining the ways in which gender identity might influence how women see themselves as science persons. In a review study about girls' participation in science, Brotman and Moore (2008) asserted that the development of a science identity is the most recently emerged theme in the gender and science literature. As they recommended "schools, as well as society in general, need to make room for identities that defy commonly held, stereotypical norms about both gender and science" (p. 21). These ideas surfaced in the findings of this study as evident in different episodes where the participant of this study was filtering her science experiences through her gender identity.

Science identity has been defined in the literature as the view of self as a successful science learner and/or a future scientist (Carlone & Johnson, 2007). More specifically, science identity has been defined as consisting of three dimensions: (a) *competence*: knowledge and understanding of science content; (b) *performance*:

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social performances of relevant scientific practices, such as collecting and analyzing authentic data using scientific instruments and, (c) *recognition*: recognizing oneself and getting recognized by others as a science person (Carlone & Johnson, 2007).

The study reported in this chapter is framed within this model of science identity as it examines how these three dimensions intertwine to characterize Anna's, a beginning elementary science teacher, emerging science identity. As such, in exploring Anna's science identity, I provide evidence for Anna's competency as a learner/teacher of science, her performance as a science learner/teacher, and how she recognizes herself and is recognized by others as a science person.

Identity Through Life-History

In this chapter, I frame Anna's story in relation to science within a life-history or biographical perspective. Knowles and Holt-Reynolds (1991) use the terms biography and personal histories interchangeably to refer to the many and varied experiences that pre-service teachers bring with them to teacher education, and which have influenced the ways they think about teaching. But, why does life-history provide a useful lens for examining teachers' science identity development? Goodson and Sikes (2001) argued that the stories people tell about their lives provide useful and important insights into big questions of social life because they offer evidence of how individuals negotiate their identities and, consequently, experience, create, and make sense of the rules and roles of the social worlds in which we live in.

For the purposes of this chapter, identity is conceptualized as a *lived experience* (translated from the Russian term *perezhivanie*, coined by Vygotsky) which is used to describe the ways in which people perceive, experience, and process the emotional aspects of social interactions. As such, *lived experience* presents a dynamic, fluid, and complex unit of analysis between personality characteristics and environmental characteristic. Lived experience, in this study, is used to emphasize that: (a) cognition/thinking/meaning are inextricable from feelings/emotions/meaning; and, (b) learning and experience are intrinsically situated in a matrix of life trajectories and ecological transactional aspects throughout one's life. In doing so, science identity is conceptualized as a *dynamic process of becoming* instead of a product, and an emphasis on the affective domains of the pathways through which teachers come to form their science identities. The centrality of emotions is found in the concluding pages of *Thinking and Speech*, where Vygotsky discusses the dialectical relationship between thought, affect, language, and consciousness: "Thought has its origins in the motivating sphere of consciousness, a sphere that includes our inclinations and needs, our interests and impulses, and our affect and emotions" (1935/1987, p. 282).

By conceptualizing identity as a lived experience, emphasis is placed on the affective domains of a science teacher's identity development and on the ways in which their emotions throughout their life histories as science learners might influence their developing science identities. For the purpose of this study, in analyzing

Anna's life history in relation to science I looked for the presence of achievement emotions, defined as emotions tied directly to achievement activities or achievement outcomes (Schutz & Pekrun, 2007), within the various experiences that might have impacted the development of her identity. A life history perspective then is used both as a theoretical framework and a data collection tool for this study. By adopting a life history perspective, emphasis is placed on the historicity of identity or how identity is developed over time within various kinds of contexts. By using life history as a data collection tool, emphasis is placed on the stories that teachers make out of their experiences, and how those can be used as data for exploring their developing science identities. In examining these stories, the three dimensions of science identity serve as a unit of analysis across time and within contexts: competence, performance, and recognition.

Teacher Identity Research

There is a growing interest in the construct of science teacher identity with an increasing number of studies exploring science teachers' identities and experiences that impact their formation (e.g., Avraamidou, 2016; Moore, 2008; Rivera-Maulucci, 2013; Varelas, 2012). Researchers have viewed teacher identity in terms of: how teachers view themselves and are recognized by others (Gee, 2000); the stories that teachers create and tell about their teaching lives (Connelly & Clandinin, 1999); the communities in which teachers participate, learn and develop (Wenger, 1998); a gender perspective (Carlone & Johnson, 2007); and, through a positionality lens (Moore, 2008). My work is situated in Connelly and Clandinin's (1999) conceptualization of identity, who proposed the use of personal histories to frame teacher identity and referred to teachers' professional identity in terms of "stories to live by" (p. 4). In doing so, my work is framed within the notion of narrative inquiry, which is premised on the idea that, as human beings, we come to understand and give meaning to our lives through stories. As Connelly and Clandinin argued, a teacher's knowledges are "narratively composed, embodied in them and expressed in practice" (Clandinin & Connelly, 2000, p. 124) in the form of stories.

To examine these stories Clandinin and Connelly (2000) developed the Three-Dimensional Space Narrative Structure, which is defined by three major dimensions: (a) interaction; (b) continuity; and, (c) situation. *Interaction* refers to two aspects of experience: personal – look inward to internal conditions such as desires, feelings, and hopes; and, social – look outward to existential conditions in the environment with other people and their intentions, purposes, assumptions, and points of view. *Continuity* refers to the idea that experiences have a past, a present, and a future reference. Lastly, *situation* places an emphasis on the context where events take place and experiences take hold. Clandinin and Connelly's conceptualization of teacher identity in terms of stories has been used as an analytical framework for the study reported in this chapter aiming to examine how Anna's narratively-composed science identity is embedded in her life history. Hence, I explore her

narrative in relation to science in terms of its continuity through three different times: past, present, and future. In doing so, I filter her narrative through three analytical lenses that comprise the dimensions of a science identity: *competence*, *performance*, and *recognition*. As such, the main research question that guided the analysis of Anna's story in relation to science is the following:

- What kinds of lived experiences throughout childhood, schooling, university, and first-years of teaching shaped Anna's science identity?

On the Where and How of the Study

The study is situated in Southern Europe and Anna is a middle-class Caucasian, 25 years old, who went through a typical 4-year elementary teacher preparation program and took three science content followed by a methods course. At the time she entered this study, Anna had 2 years of teaching experience and she was enrolled in a graduate master's program in science education. Anna was a motivated, average-ability (by GPA means) graduate student, with no special interest in science. In a sense, Anna offers a profile of a typical elementary teacher in the context where this study took place, and that is why she was chosen to participate in this study to provide a more representative case.

Several kinds of data were collected for the purpose of exploring Anna's life history in relation to science: a detailed science-biography, three brief biographical assignments, a personal philosophy of teaching statement, and a 2-h long interview. The data were collected over a period of a year during which Anna was enrolled in the master's program. To analyze the data, I first organized those chronologically: past experiences through schooling as a science learner, current views about science teaching and experiences at the university, and vision of self as a teacher. In doing so, I was looking for data that would help me examine the impact of various experiences Anna had throughout her life on the development of her identities. In what follows, I narrate Anna's story in a chronological order, starting from her childhood experiences and ending with her professional teaching experiences.

Anna's Story in Relation to Science

I narrate Anna's life-history in relation to science by framing it through the Three-Dimensional Space Narrative Structure. Her story is structured in a chronological sequence starting from her early life experiences, navigating through the present while looking into the future. Throughout this narration I exemplify how different experiences were influential to shaping the three dimensions of Anna's science identity: competence, performance and recognition.

Elaborating on her childhood memories, Anna stated that she always wanted to become a teacher, even at the age of 6. The following extract from her interview reads as follows:

To become a teacher for me was life dream, which started from a very young age. From kindergarten already, when I was asked what I wanted to be when I grow up, I would say: “a teacher”! (Anna, interview)

A critical influence on her decision, as she described, was the fact that both of her parents were teachers.

Both my mom and my dad were teachers, so I had an understanding of what their job was about and how it looked like on an everyday basis. But, most importantly, I remember how the rest of the family and the community had a big sense of admiration for them. (Anna, interview)

It's interesting to notice in this above extract how Anna pointed to the fact that her parents were recognized by others alongside a sense of admiration from the community. A possible assumption is that implicitly Anna was thinking how she would be *recognized* in the same way by her family and community, if she followed the same career path as her parents. Another influence from her family environment were Anna's grandparents who were farmers and who provided her with ample opportunities to experiment in nature. Below is an extract from her autobiography:

My grandparents were farmers, they had a farm with animals and were also growing potatoes, tomatoes, and other vegetables. I used to spend a couple of months in the summer at the farm helping them out, so I learned a lot of things about the weather, animals, and plants. (Anna, autobiography)

From this extract, another dimension of science identity is starting to surface: *competence*. As evident in Anna's words with the use of “I learned a lot of things”, she was developing a sense of a competent science learner.

Going to elementary school, Anna felt that she had more knowledge about the natural world because of these experiences, than the rest of the classroom. Elaborating on her experiences as a science learner, she shared positive memories of experimenting with science:

I was really excited about science, we were studying very interesting topics, and we used to go on field-trips quite often. I remember visiting a dam, an environmental center, and also a museum about water. During these visits we had opportunities to take scientific measures, such as for example, the temperature of the water of the dam. I was very excited about these experiences, especially the use of real scientific instruments! (Anna, biographical assignment)

It becomes clear in this extract how Anna's *competence* was matching her *performance* as a science learner, another dimension of science identity. This extract illustrates that not only did she feel competent as a science learner she also developed the necessary skills for the *performance* of relevant scientific practices (e.g., application of scientific tools).

In secondary school, as Anna noted in a biographical assignment, her interest in science started to decline because the lessons became more theoretical:

Science became one of the most boring lessons. I was not excited about science no more. I don't remember carrying out any experiments. I remember having to read and write a lot, which I hated actually. (Anna, biographical assignment)

It's interesting to notice here the shift on Anna's interest in science but also her emotions towards science learning. The choice of words 'boring' and 'not excited' serve as evidence of the negative impact of these schooling experiences on her interest in science. Besides the fact that students were not involved in experimentation, Anna commented on the characteristics of her science teacher:

Our science teacher was very strict. It looked like he was obsessed with physics and mathematics, very knowledgeable but he wasn't able to explain things to us. Each time I would pose a question he would respond with a sarcastic comment implying that my question was stupid. So, I started feeling anxious, and I stopped asking questions (Anna, biographical assignment).

Three things become of great interest in this extract. One is related to science stereotypes (e.g., a man who is obsessed with physics, inability to communicate ideas to others), the other one is related to how Anna was being *recognized* as a science learner (e.g., the teacher's response making her feel that she was stupid) and how Anna's emotions influenced her performance (e.g., feeling anxious, stopped asking questions). These ideas might imply issues related to gender and women's engagement in science. First, it might be possible that this teacher did not enact gender inclusive practices and did not make an effort to support female students' participation in science (though there is not explicit evidence in the data to assert this), but it is also possible that Anna filtered these experiences through her gender identity. As will become apparent later on, she was better able to relate with her female university instructors, even though those instructors used contemporary approaches to science teaching as well, which makes it difficult to tease out whether gender alone had an influence on her identity trajectory.

Similarly to the above extract, Anna again chose the words 'feeling anxious' which point to her emotions as a learner of science. In the interview, I asked Anna to elaborate on this and so she described what a typical lesson looked like. She responded as follows:

...he would start a lecture about a new subject. From time to time he would stop and ask if we had any questions. Nobody ever had any questions of course because it was so hard to follow him but also because we also felt intimidated. (Anna, interview)

It becomes apparent through Anna's words that these experiences impacted in a negative way not only her interest in science and *competence* (i.e., felt intimidated) but also her *performance* as a science learner (i.e., not asking questions). It is interesting to note in this description how Anna referred to feeling intimidated by this teacher, which can be traced back to her science identity as a learner of science. Going to high school, Anna experienced science even in worse ways. She described very difficult and theoretical lessons, and very strict teachers. As a result, by the end of high school she lost any interest she had for science completely. In describing one of her teachers, many science stereotypes came to surface:

When he entered the class for the first time, we were all shocked. He looked like Einstein – he was bald, and enormous eyebrows. He would usually say things like science is the best discipline...he was arrogant, and rude, and a really bad teacher. Science lessons felt like a nightmare by the end of high school. (Anna, interview)

Anna's interest in science was revived when she went to university after completing a set of compulsory science courses. Even though, as she said, she dreaded the day that she would have to take a set of mandatory science courses, she enjoyed all science content courses as well as the methods course that she took. Because of these experiences she decided to specialize in science education. In describing her experiences as a preservice teacher, she shared memories of experimentation, projects, examination of socio-scientific issues, and interdisciplinary approaches. In a journal she wrote:

First, I learned a lot so I feel confident in my content knowledge. But, I also enjoyed the ways in which the lessons were taught because we were always engaged either in experimentation or in large-group discussions. The classroom climate was friendly and we all felt comfortable in asking questions, especially because all of our teachers were younger women, and so we were not intimidated. (Anna, journal entry)

It becomes clear in this quote how Anna's science identity was shaping because of how her *competence* as a science learner was being supported (i.e., confidence) but also her *performance* was enhanced (i.e., engaged in experimentation and classroom discourse). It's also interesting to notice the choice of various words that point to her emotions such as, feeling comfortable, enjoyment, not being intimidated, which indicate a positive shift in her identity as a learner of science, especially on her competency. Also, it's interesting to note that Anna made an explicit reference to the gender of her instructors (who were women), which again might imply the role of gender in filtering these science experiences.

In the interview, Anna shared similar positive experiences and emphasized the impact that the science methods course had on her:

I loved the science methods course. Through the course, we saw in practice how contemporary approaches to science teaching could be applied in practice, such as for example scientific inquiry. I felt that the course prepared me to be an effective teacher...but, most importantly it made me gain confidence in myself as a future science teacher. (Anna, Interview)

It's clear in this extract that her university experiences impacted Anna's developing science identity and specifically her *competency* (i.e., confidence in self).

Sharing her experiences as a beginning teacher, Anna reflected on her experiences as a learner of science to pinpoint how those experiences shaped her views about science teaching and learning, and how children learn science.

I realize now how my practices have been influenced by my past experiences as a science learner. I do not want to be that teacher who puts students off science, who scares them away, who intimidates them. I want to make them realize the value of science to their lives and to make them passionate about science, as my university instructors did for me! (Anna, interview)

These words speak directly to Anna's *performance* as a science teacher. These reveal a strong science identity of a teacher who has a clear vision of how she aspires to be. Additionally, these words might also imply how Anna would like to be *recognized* by her students, as an inspiring and passionate teacher, the same way that she recognized her university instructors.

When I asked her to explain how she tries to achieve this goal, she said:

I always engage them in some kind of experiment or activity, I try to make connections between what we learn in class and their everyday lives. But, most of all, I try to create a fun and friendly learning environment, I want them to feel excited to be there. This is the kind of teacher I aim to be! (Anna, interview)

This extract illustrates a sense of Anna's high *competence* and *performance* as a science teacher. Her words reveal a high self-efficacy and confidence as a science teacher who is able to perform or enact specific practices to achieve her goals. What's also interesting to observe here is the emphasis that Anna places on creating a fun and friendly learning environment, which implies her attention to developing a positive emotional climate in her classroom. In her personal philosophy statement, Anna described the kinds of approaches and strategies that she uses in her practices, which serve as evidence of her performance as a science teacher:

I engage them in inquiry-based investigations, in field-studies, in examination of real-life issues like, for example, the quality of air. Of course, I engage them in experimentation and in using technology applications, such as mobile games. Most importantly, I try to engage them in discussions about the value of science to society and the work of scientists. (Anna, personal philosophy of teaching)

Various contemporary ideas about science teaching become apparent in this extract that reveal Anna's strong science identity through her *competency* and *performance*: enactment of inquiry-based science, use of modern technology applications, establishing links between science and society as well as addressing science stereotypes. These ideas featured centrally not only in Anna's personal philosophy but also in her journal entries as well as her interview, which provides evidence of the maturity and consistency of these ideas.

Conclusions and Implications

What the story of Anna tells us is how complex beginning elementary teachers' identity trajectories are, influenced by various kinds of experiences throughout their life histories. As evidenced in Anna's story, she viewed herself as a successful science teacher, one who uses contemporary approaches to science teaching and serves as a positive role model for her students. Anna was recognized as a successful learner of science by her family, and she also performed well in science, as a young learner in science. That, however, was not the case in secondary and high school, when Anna experienced science teaching through teacher-centered approaches and came across teachers that impacted her emotional trajectory as a learner of science

in negative ways. During that chronological period two things surfaced: she was not recognized as a successful learner of science by her teachers, and as a result, she did not feel competent and did not perform well as a science learner. It was not until Anna went to university that her interest in science was revived because she experienced science in personally meaningful ways, and she came across strong female role models. At that time, Anna was also recognized as a successful science learner by her instructors, she performed well and viewed herself as a competent science learner and future teacher.

In describing her experiences with science from her childhood through her first-years of teaching, Anna placed emphasis on affective domains of her development, which points to the role of the emotions on her identity trajectory. In several instances she described her emotions as a learner of science (e.g., scared, excited, bored) which were directly connected to her science identity. Moreover, the possible role of gender in filtering her science experiences appeared to emerge in different instances, even though this was not conscious and she never made any explicit statements about that. However, in describing her science teachers in secondary and high school she emphasized that those were “strict men” and when describing her university instructors she emphasized that they were “young women”. These references deserve further attention. Gender and its role to the development of a science identity has featured centrally in various studies that range from examining women scientists’ identities (Carlone & Johnson, 2007) and young girls’ participation in science (Brickhouse, Lowery & Schultz, 2000).

Drawn within the findings of this study, and building upon existing literature on science teacher identity, the study provides evidence for the need of conceptualizing teacher identity as a lived experience, the value of life-histories in examining identity development, and the role of emotions in teachers’ identity development. A few other researchers in science education have argued about the affective domains of teachers’ learning and development and the central role of emotions in teacher identity and identity development (e.g., Rivera-Maulucci, 2013; Zembylas, 2005). Rivera-Maulucci (2013) argued that “emotions influence the goals teachers set and indicate the intensity of their relationships to ideas, to their beliefs about science, to others, and to science teaching” (p. 137). In agreement with this view, Tobin and Llena (2012) stated that emotions are constituents of a teacher’s identity as well as enactment. Likewise, Zembylas (2005) stated, “the ways in which teachers understand, experience, perform, and talk about emotions are highly related to their sense of identity” (p. 937).

The findings of the study showed how Anna’s identity trajectory shifted and reformed through teacher preparation, and provide evidence of the significant impact of the elementary methods course in supporting Anna reflecting on her prior experiences as a learner and developing contemporary ideas about science teaching and learning. Specific aspects and experiences within teacher preparation appeared to have a critical impact, and which have implications for the design of teacher preparation programs. These are as follows:

- Understanding that a science teacher's identity has multiple dimensions that go beyond cognitive domains of learning and address these through teacher preparation;
- Providing opportunities for preservice teachers to be recognized as successful science learners and/or future teachers;
- Paying attention to the emotional experiences and how these interrelate with teachers' identity trajectories;
- Examining preservice teachers' personal histories in relation to science as they enter a preparation program to better understand and address their needs as future teachers;
- Providing opportunities for identity shaping and re-shaping, as well as offering opportunities for self-reflection on life histories

This chapter presents my narration of Anna's narrative or life history in relation to science, which consists of a series of stories that took place throughout her life. My narration is, in fact, a selection of small stories that construct and reconstruct her narrative. As any other narration, this one as well, is bounded within my subjective interpretations of Anna's story. It is, therefore, likely that through my subjective interpretations I have highlighted certain dimensions, experiences, and events over others concerning Anna's emerging identity as a science teacher. As such, this narration is composed by the pieces or small stories that I chose to put together to articulate how Anna's science identity was shaped and what kinds of experiences were critical to its development.

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