

# “I didn’t know water could be so messy”: coteaching in elementary teacher education and the production of identity for a new teacher of science

Christina Siry · Johaira Lara

Received: 13 March 2010 / Accepted: 28 May 2011 / Published online: 16 August 2011  
© Springer Science+Business Media B.V. 2011

**Abstract** Through the examination of the experiences of a pre-service teacher participating in a field-based science methods course, we make evident the ways in which a combination of collaborative teaching experiences and reflexive dialogues allowed for the evolution and transformation of her identity. This teacher is Johaira Lara, the second author of this paper, and we have engaged in a cowriting approach that has created layers of writings over time, with the focus of providing evidence of her changing perceptions and understandings of teaching and learning science. We describe the ways coteaching and cogenerative dialogues provided the opportunity for Johaira to examine and reconsider her views on science teaching, and mediated the production and transformation of her identity. We offer an evolving analysis of her identity transformation related to specific aspects of the course that were pivotal for her emergence as an elementary teacher of science.

**Keywords** Elementary science teacher preparation · Identity · Pre-service teacher education · Field-based courses · Cowriting

**Resumen:** Esta investigación examina cómo cambiaron las perspectivas sobre la ciencia y su enseñanza de una profesora en formación a lo largo de un semestre en el que se trabajó conjuntamente con maestros en ejercicio en la enseñanza de las ciencias a niños del tercer grado de educación. Esta futura profesora es Johaira Lara, coautora de este documento. Ubicamos estas consideraciones de cambio hacia la ciencia y su enseñanza dentro de una exploración de su continua evolución y cambio de identidad como profesora de ciencias. Asimismo este proceso se sitúa en un curso práctico de metodología de enseñanza de las ciencias. Además enfatizamos en las conexiones que se establecen cuando se combinan las experiencias de campo y los diálogos co- generativos o generados conjuntamente (Tobin and Roth 2006) para el desarrollo de la reflexividad y la transformación de la identidad. Sugerimos que las transformaciones de la identidad ocurren dentro de la

---

C. Siry (✉)  
University of Luxembourg, Route de Diekirch, 7220 Walferdange, Luxembourg  
e-mail: Christina.Siry@uni.lu

J. Lara  
Park Avenue School, Port Chester, New York, USA

complejidad de la interacción propia de los diálogos reflexivos desarrollados en torno a las experiencias de enseñanza de las ciencias en el aula de clase. Estos cambios están relacionados con las visiones epistemológicas sobre la enseñanza y aprendizaje de las ciencias que tiene Johaira, las cuales son parte integral de su identidad como profesora de ciencias. En esta investigación examinamos cómo cambian estas visiones a través de su participación en un curso práctico de enseñanza de las ciencias. La pregunta principal que guía este trabajo es: ¿cómo la participación de Johaira en un curso práctico de enseñanza de las ciencias influye en su evolución como profesora? A través de una escritura conjunta buscamos revelar las experiencias de Johaira lo más fidedignamente posible utilizando un enfoque de escritura por capas o niveles. Al buscar conjuntamente respuestas a esta pregunta, hemos hecho preguntas epistemológicas acerca de cómo los pensamientos sobre la enseñanza, el aprendizaje, la naturaleza del conocimiento y la relación entre el aprendiz y el conocimiento se modifican y cambian a medida que Johaira evoluciona como profesora de ciencias. Ilustramos cómo su participación en un curso práctico de enseñanza de las ciencias ha servido de apoyo para su cambio relacionado con la enseñanza y el aprendizaje de las ciencias. Posteriormente demostramos cómo estas experiencias crearon oportunidades para la producción, reproducción y transformación de su identidad como maestra de ciencias. A través del análisis de varios relatos de comienzos y finales del curso demostramos cómo Johaira empezó a ser consciente de sus propias expectativas de enseñanza de las ciencias y su cambio de perspectivas sobre la enseñanza y aprendizaje de las ciencias. Además, enfatizamos cómo ella empezó a ser consciente de lo impredecible que es la enseñanza de las ciencias y cómo esta conciencia generó conflictos con sus propias expectativas. Dentro de la estructura de este curso ella se comprometió en un proceso reflexivo que apoyó un entendimiento progresivo de cómo la percibían sus estudiantes en este momento y como quería que la percibieran en el futuro. La participación en la actividad de enseñanza compartida ayudó a Johaira a confrontar sus suposiciones epistemológicas acerca de la naturaleza de la enseñanza y el aprendizaje, y desarrollar una conciencia de sí misma como profesora de ciencias. Johaira inició el curso con visiones tradicionales de la enseñanza y el aprendizaje que consideran el conocimiento como autoritario y fijo. Al comienzo del curso ella creía que la ciencia consistía en hechos estáticos y textos que debían leerse. Las evidencias de sus expectativas cambiantes acerca de la enseñanza y el aprendizaje de las ciencias provienen de relatos y reflexiones de Johaira los cuales demuestran sus cambios entretejidos. Mediante su participación activa en el curso práctico de metodología de enseñanza de las ciencias su identidad fue producida, reproducida y transformada en un proceso continuo, a la vez que Johaira fue aceptando oportunidades que estructuraron sus experiencias y la apoyaron para hacer su propia y genuina contribución al curso. La transformación que Johaira experimentó proviene en parte de la expansión de su agencia, lo cual le permitió alcanzar sus metas y construir una identidad asociada con el aprendizaje y enseñanza de las ciencias.

**Zusammenfassung** Diese Studie stellt heraus wie sich bei einer Lehramtsstudentin, die mit Ihren Kollegen während eines Semesters naturwissenschaftlichen Unterricht gab, die Sicht auf die Naturwissenschaften und den naturwissenschaftlichen Unterricht verändert. Dies ist Johaira Lara, die Co-Autorin dieses Artikels. Wir machen den veränderten Zugang von Johaira zum naturwissenschaftlichen Unterricht in der Auseinandersetzung mit ihrer sich laufend weiterentwickelnden Identität als Lehrerin fest, und verorten diesen Prozess in der Teilnahme an einem unterrichtsbezogenen Methodenkurs. Wir stellen die Verbindungen zwischen dem Zusammenspiel praktischer Erfahrungen auf der einen Seite

und dem kogenerativen Dialog („cogenerative dialogue“, Tobin and Roth 2006) auf der anderen Seite dar, und dokumentieren die Entwicklung von Johairas Reflexivität sowie Veränderungen ihrer Identität. Diese treten unseres Erachtens im Rahmen komplexer Interaktionen des reflexiven Dialogs in der praktischen Erfahrung des kollaborativen Unterrichts in eine 3. Primarschul Klasse auf. Sie stehen in Zusammenhang mit Johairas epistemologischen Ansichten zum naturwissenschaftlichen Unterrichten und Lernen, welche einen wesentlichen Bestandteil ihrer Identität als Lehrerin für Naturwissenschaften ausmachen. Wir untersuchen wie sich diese epistemologischen Ansichten durch Johairas Teilnahme an einem praktischen unterrichtsbezogenen Methodenkurs verändert haben. Zentrale Fragestellung der Arbeit ist, welche Rolle die Teilnahme an einem gemeinsamen, unterrichtsbezogenen Methodenkurs für Johairas Entwicklung als Lehrerin spielt. Wir zeigen, auf welche Weise sich diese Teilnahme unterstützend auf Johairas Lehr- und Lernfähigkeiten auswirkt und wie diese Erfahrungen für ihre Identität als Lehrerin für Naturwissenschaften eine Entwicklung, Reproduktion und Transformation ermöglicht haben. Durch die Analyse mehrerer Anfangs- und Endsequenzen des unterrichtsbezogenen Methodenkurses zeigen wir, wie sich Johaira ihrer Erwartungen an sich als Grundschullehrerin bewusst wird, und wie sich ihr Blickwinkel auf naturwissenschaftliches Lehren und Lernen verändert. Es wird dabei hervorgehoben, wie sich Johaira der Unvorhersehbarkeit naturwissenschaftlichen Unterrichts klar wird und wie dies im Widerspruch zu den Erwartungen bezüglich ihrer eigenen Lehr- und Lernprozesse steht. Johaira entwickelt innerhalb des Kurses eine bewusste Selbstwahrnehmung, die sie befähigt zu reflektieren, wie sie von den Schülern wahrgenommen werden möchte. Die Teilnahme an der gemeinsamen Lehrtätigkeit unterstützte Johaira bei der Reflektion ihrer epistemologischen Annahmen über die Natur des Lehrens und Lernens und bei der Entwicklung ihres Selbstwertgefühls als Lehrerin für Naturwissenschaften. Am Anfang des Methodenkurses hatte Johaira traditionelle Ansichten von Lehren und Lernen, in denen Wissen als festgeschrieben und unveränderlich gelten. Zu Beginn des Kurses glaubte Johaira, dass Naturwissenschaften aus statischen Fakten und Pflichtlektüren besteht. Dass sich Johairas Erwartungen verändern, wird an Beispielen sowie an Johairas Reflektionen gezeigt. Durch die aktive Mitarbeit in dem praktischen Kurs wurde in einem fortlaufenden Prozess eine Identität konstruiert, reproduziert und transformiert, während Johaira die Möglichkeit erhält, ihre Erfahrungen zu strukturieren und eigene Beiträge zum Kurs zu entwickeln. Die Veränderungen kamen zum Teil durch ihrer stärkere Beteiligung und ihrem Handeln, wodurch sie in die Lage versetzt wurde, ihre Ziele zu erreichen und eine Identität aufzubauen, die mit ihren Lehr- und Lernvorstellungen übereinstimmt.

At the beginning, I used to always think about what it was that I was going to say and how I was going to word what to say to kids. I learned that although this made me feel prepared, it never went as I expected. Science, especially, is a subject that can have so many different outcomes. So can science teaching. I began to see the importance of discovering. I think that this is a problem with students not enjoying science, because they have to memorize facts without discovering. That's not really science. Now I feel like I understand what science is, and how I can teach it better.

In the above comment, Johaira (the second author) discusses her perspectives towards science and science teaching after participating in a field-based science methods course. She reflects upon the ways in which teaching does not always go as planned, and also comments on the ways in which both science teaching and science learning can have a

variety of outcomes. In this paper, we examine the ways in which her perspectives on science and science teaching changed during a semester working with her colleagues teaching science to children. We position these changing considerations towards science teaching within an exploration of her continually evolving and shifting identity as a teacher of science, and we situate this process within a field-based science methods course. In this course, coteaching science to children and engaging in cogenerative dialogues served as structures that mediated Johaira's agency as a teacher. She was able to consider her shifting perspectives of science and her sense of herself as a teacher through this course. Our central argument herein is that Johaira's identity as a teacher of science was mediated by her participation in a science methods course in which she worked with her colleagues to teach science to children. As we present a variety of perspectives on her experiences to illustrate our main claims, we elaborate on our points that the transformation of her identity occurred through a complex interaction of her participating in coteaching science coupled with reflexively engaging in dialogue with others on their shared experiences.

### **Learning to teach in classrooms**

Our work documents a science methods course in which we both participated, Chris (first author) as the instructor and Johaira (second author) as a pre-service teacher participant. A central concern in the teaching of methods courses is to connect the abstractions inherent in the curriculum of the university course to the practical realities and concerns that occur during teaching and learning in schools. Being a student in a university course is quite different from being a teacher, and it is the development of identities from "student" to "teacher" that is salient to this research. The potential disconnect between the role of a university student and the role of a teacher is a dilemma in teacher education, and to address this, many teacher education programs have incorporated a variety of field experiences early on in programs that occur in conjunction with methods courses. Studies of learning to teach in such field-based settings have documented differences in perspectives of teacher identity, and a review of literature in teacher education presents a variety of approaches in education courses that can be useful for supporting and examining identity development (e.g., Antonek, McCormick, and Donato 1997). In particular, learning to teach in classrooms can be a valuable way to connect pre-service teachers education courses with their teaching practices (Henning and Yendol-Hoppey 2004). However, from an identity development point of view, while the potential of connecting education courses and actual teaching practice is an important pedagogical consideration for teacher education, what studies have also shown is that field-based experiences alone may not be sufficient to support pre-service teachers' transformations from student to teacher. For this reason, the development of identity has been called one of the most fundamental problems in teacher education (ten Dam and Blom 2006). Being, and becoming, a teacher is a complex process, one that is certainly unique to each person. In this study it became clear to us that our identities as teachers are predicated on our epistemological perspectives, and we contend that within the process of "becoming a teacher" there needs to be structures that can support new teachers who are engaged in the process of shifting identities from student to teacher. These structures could provide the space for participants to reflexively examine these perspectives of teaching, learning, and the nature of knowledge, in order to shift from seeing themselves as a "student" to begin to see themselves as "teacher".

Examining identity development within teacher education is a complex endeavor, given the personal nature of interpreting one's role as a participant in the culture of teaching and

the shifting construct of identity. In an attempt to recognize the personal nature and interpretations of identity, this paper examines one teacher's identity in relation to the evolving connections between her participation coteaching in a field-based science education course, and her involvement in weekly reflective dialogues removed from the elementary classroom. As preservice teachers learn to participate in the social and cultural practice of teaching, reflexively examining these experiences within separated liminal spaces can support teachers' developing identity (Cook-Sather 2006). Herein we emphasize the connections between the combined role of field-based experiences and cogenerative dialogue (Tobin and Roth 2006) for developing reflexivity and transforming identity, and we suggest that identity transformations occurred within the complex interaction of reflexive dialogue in between collaborative field-based classroom teaching experiences.

In the sections that follow, we explore Johaira's identity specifically as it shifted and changed during her time within a field-based science methods course. To briefly introduce our context, which is elaborated in later sections, coteaching and cogenerative dialogue are foundational components, and as such, the structures of the course emphasize shared responsibility through the collaborative development and teaching of science lessons to elementary children in an urban school. We refer to these courses as *collaborative field-based courses*, because the central focus is collaboration as a critical aspect of learning how to teach while learning about teaching. In this course, participants meet twice weekly, once on the college campus for cogenerative dialogues and planning sessions, and once in the elementary school to collaboratively teach science lessons to children. Such a structure has been created in order to combine field-based experiences with distinctly separate opportunities to discuss upcoming lessons, debrief previous lessons, and share experiences with each other. Most importantly, the campus-based meeting times become a space where pre-service teachers are able to discuss their successes and challenges in the classroom, and reflexively explore their roles as new teachers of science in order to improve the teaching and learning of science.

In this paper we present our research into how participating in this course supported epistemological shifts in one pre-service teacher (Johaira) and how the changes in these were transformational to her identity as a new teacher of science. We present multiple chronological episodes from our study at different points in time, and we do this through four layers of writing. The first is a selection of classroom vignettes, and the second layer is Johaira's written commentary on these vignettes. The third layer is Chris's writing from conversations with Johaira, and includes a combination of theorizing, analysis and interpretation. The fourth is Johaira's contributions in text-boxes that respond directly to the other layers. Using Johaira's direct experiences allow us to provide an authenticity and to support the claims we are making about her experiences within cogenerative dialogues and coteaching as being instrumental to her transformation towards being and becoming an elementary teacher of science.

## Rationale and theoretical underpinnings

This study is grounded in sociocultural theory, and views teaching as cultural enactment (Sewell 1992). Through this lens, learning to teach consists of the production, reproduction, and transformation of existing forms of culture (Tobin and Roth 2006). This research explores the ways in which this cultural production mediates the transformation of Johaira's identity. People enact culture within a framework of a dynamic flux, and a socio-cultural foundation to this work emphasizes that learning and teaching require participation

in concrete praxis. Thus, participants in these field-based courses are active teachers in all science lessons in the elementary classroom during one semester and the course work is open-ended, in that all participants together structure the teacher education curriculum. A combination of field-based experiences, flexible curriculum, and shared responsibility is intended to support the pre-service teachers in the process of appropriating teaching practices as they together begin to participate in the practice of teaching.

Within this focus on learning to teach science as cultural production, dialectical relationships become salient to theorizing learning to teach science. In particular, the dialectical relationship that we are concerned with in this paper involves the relationship between agency and structure, which are critical to considering how coteaching as praxis affords the learning of the participants and the transformation of identities. This relationship will be introduced here and further explored through the telling of Johaira's story. Dialectic relationships imply that each part presupposes the other and they can never exist alone; they always coexist. Within the agency | structure relationship,<sup>1</sup> agency (the power to act) is mediated by the structures that are present. Structures are resources for producing culture, and these structures can be material items as well as conceptual, as the meanings we give to our experiences are also structures that are related to our abilities to take agency within a given situation. The central structures we examine herein are multiple and overlapping, and include (in part) the course components of coteaching in classrooms, cogenerative dialogues with peers, and the direct interactions with children. Within this framework to thinking about social life, structures are quite complex, and thus they include Johaira's experiences outside of the course that give personal meaning to the interpretations of moments, as well as the meanings she has given to her experiences within all of these, among others. All of these can both constrain and afford participants' abilities to take agency within them, and in the act of taking agency, participants shift and change the structures. For this reason, the agency | structure relationship is dynamic and continually shifting and changing. To examine specifically what occurred in our course within this relationship, we embrace the metaphor of shining different theoretical lights onto certain points in our research (Tobin 2008). As we have shone these lights on Johaira's experiences, we have illuminated some of the ways in which she has changed over time. These changes are related her epistemological views of science teaching and learning, which are an integral part of her identity as a teacher of science, and in this paper we examine how these have shifted through Johaira's participation in a field-based methods course.

### Identity is being

Identity is fluid. It is *being*, and given that we are always learning to *be*, identities can never be final. At the same time, "individuals do have recognizable selves" (Danielewicz 2001, p. 3). Writing on this dual nature of identity, Wolff-Michael Roth and Kenneth Tobin write, "on the one hand, a person appears to have a core identity, which undergoes developments that are articulated in autobiographical narratives of self" (Roth and Tobin 2007, p. 1). They continue to describe how, on the other hand, there is self in society, which is frail and fragmented, and "from one setting to the next, our identities as revealed by our transactions with others, change" (p. 1). Within this dual complexity of identity, our identities are continually transformed. This transformation occurs in part as we adapt to new situations, but also as we act to attempt to change structures to achieve our goals (Wells 2004, p. 72). Thus, identity can be considered to be an outcome of participating in

<sup>1</sup> The Sheffer stroke (|) is used to represent a dialectical relationship (Roth 2005).

ongoing activity, and a continually transforming, extremely personal, construct that reflects the activity being participated in. We believe that theorizing identity is particularly relevant for teacher education in that through participation in the activity of teaching, identities are produced, reproduced and transformed.

In this paper we are looking at the ways in which Johaira has come *be* a teacher of science. Becoming a teacher is a process of identity production, and has been described by Jane Danielewicz (2001) as “an identity forming process whereby individuals define themselves and are viewed by others as teachers” (p. 3). This process of identity production is mediated by agency | structure and is linked to a person’s epistemological positionings and perspectives, which are central to how we think about schooling writ large. Further, identity can be seen as having a sense of self (Gee 2000), and in this case, a sense of self as a teacher is an affiliation with a certain kind of person, a social bond, and thus it provides an analytical lens to how one views oneself, and one’s relations with others.

Several researchers have recently called for further research that connects identity with activity in teacher education. For example, Noel Enyedy, Jennifer Goldberg, and Kate Muir Welsh (2005) have examined the ways in which teachers’ identities are connected to their teaching practices, and argue that science teacher education literature lacks a focus on identity as it relates to the practice of teaching. Similarly, April Luehmann (2007) has analyzed research on identity development and has suggested that science teacher preparation needs to better emphasize the connections between teachers’ participating in practice and developing identities as teachers. We explore herein Johaira’s participation in the reflexive practice of teaching and engaging in dialogue with other preservice teachers, and we seek to explore through our analysis and interpretation the ways in which her identity shifted and changed within the structure | agency relationship. We next describe the structures of the science methods courses to situate the analysis that follows of Johaira’s experiences and perspectives.

## The context for our research

These collaborative, field-based science methods courses are structured around collective responsibility for teaching and learning science. Collaborative effort and shared goals create a context in which participants work together to acquire knowledge, develop lessons, teach children, and cogenerate dialogue to move their understandings forward and produce new knowledges. “Collaborative environments are open-ended, contingent, flexible, negotiable, conditional, and responsive, thus allowing the groups to engage with issues related to its members’ individual and collective identities” (Danielewicz 2001, pp. 150–151). The open-ended negotiation of class activities is central to the structure of these courses (see Siry 2011, for specific details on the course structures), and yet it makes documenting the particulars of a collaborative, field-based course a challenge. While we acknowledge the difficulties in writing about this specific approach of structuring a course around open-ended experiences, we seek to provide herein a broad description of the ways in which a flexible course structure unfolded in order to contextualize Johaira’s experiences. Thus, in the following section we describe the specifics of the course components of coteaching and cogenerative dialogues.

## Sharing responsibility for teaching and learning

The curriculum for our teacher education course was grounded in the practice of teaching, and unfolded over time as participants shared responsibility for deciding on what was to be taught in the elementary classroom, and what they themselves still needed to learn about. This course has been taught by Chris nine times, and a consistent event that occurs at the beginning of each semester is that the classroom teacher<sup>2</sup> and Chris meet to discuss upcoming science units that will be taught in the elementary classrooms and choose a topic for the pre-service teachers to learn about and teach that is complementary to the units that the children will be learning. For example, during Johaira's semester, the topic was water, and this topic was presented to the pre-service teachers on the first day of class, as they began to learn about coteaching and cogenerative dialogues. Chris is explicit with her rationale for implementing these structures, and the class spent the first several course meetings working out the logistics of how the rest of the sessions will unfold. Things that were negotiated in these meetings include the focus of the lessons, which participants were to be responsible for which lesson, and how individuals would work together in small groups based on interests to develop their lessons together.

These organizing sessions occurred for the first month of the course, and pre-service teachers learned to access resources for planning elementary lessons and supported each other in developing activities to engage the children. Together they learned the content that was required to teach the lessons, and often taught each other requisite knowledge for the upcoming lessons. In this way, the curriculum for the field-based methods course emerged from what the participants decided as important to focus on, and as such, the responsibility for planning the bi-weekly course sessions was shared among all course participants. For example, in one course session at the beginning of the semester we decided to read the state science standards in order to learn about the curricular expectations for teaching about water (the chosen focus for our work that term). Within this reading and following discussion, we decided together which specific characteristics of water would be important for third graders to learn about. From there, we collectively organized how the topics would best flow to create a clear unit, and then each participant chose one of these topics to focus on and research individually. When we met again as a class, preservice teachers divided themselves into two smaller groups and shared the information they had gathered with their small group. The following three course sessions were devoted to organizing their lessons, and in between these meetings, the individual preservice teachers worked on their lessons by further researching and reflecting on objectives and possible activities. In this way, the construction of the unit was both individual and collective, and the responsibility for developing science lessons were shared. As the semester progressed, coming lessons were further refined in cogenerative dialogues, as the group reflected upon previous classroom events and their experiences coteaching the lessons with the goal of improving the teaching of science in the future lessons.

Within coteaching relationships, "participation in the planning process is critical because a shared understanding of the intended plan of action provides each person with a 'sense of the game'" (Martin 2009, p. 581). As we developed shared goals for the unit, all participants worked together to have a clear understanding of each individual participants' expectations. This combination of individual plans and collaborative planning is critical to the unfolding of the coteaching relationships, and once the initial lessons were planned,

---

<sup>2</sup> There are multiple teachers that have participated in these classes and when we are writing generally about them we refer to them in this way. In specifically referring to our partner teacher for the semester this research emerged, she has been assigned the pseudonym Mrs. Turner.



participants worked together to coteach these lessons on a weekly basis in the elementary classroom. Tobin and Roth have conducted extensive research on the use of coteaching, and suggest, “new teachers should not remain on the side observing others teach and taking notes for too long” (2006, p. 27). To that end, our field-based experiences began with pre-service teachers visiting the children as a group once, in order for the classroom teacher to introduce the children to how the science lessons would be taught by the group on a weekly basis. Pre-service teachers then immediately moved to tables with groups of children and began to engage in dialogue with the children around the teaching and learning of science. In this approach, the pre-service teachers were central participants in the classrooms from the beginning, and were positioned as such for themselves as well as the children. The children were simultaneously positioned as experts, as pre-service teachers asked them questions about what it is like to be in their grade and in their class, and what they were learning in science. Through these conversations with the children, the preservice teachers learned about what the children’s interests were in order to contextualize their upcoming experiences.

For the duration of the semester, all course participants met for cogenerative dialogues several days following each of the visits to the elementary school. Cogenerative dialogues are conversations that involved the participants from the coteaching experience, and they are intended to provide a space to “meet to discuss what happened, why it happened, and how learning might be afforded in the future” (Roth and Tobin 2002, p. xv). In addition, in our sessions, we focused on making aware moments that might have been observed by some participants but not all. These conversations allowed for collective sense making, and for discussing upcoming lessons in order to improve the learning experiences each week, both for the children as well as for the pre-service teachers. This opportunity for collective debriefing, sharing of events, and reflecting upon different experiences also facilitated individual sense making, as we worked together to reinforce and navigate our identities as teachers of science.

Important to recognize within the goal of a co-constructed course is the role of power and how it plays out as participants move towards taking agency regarding the directions of a university course. Relationships within educational settings are situated within complex, historically grounded power relations, and these implicit and explicit expectations are central to considering the roles of teachers and students, regardless of whether the “students” are children or adults within a university course. Collaborative structures that emphasize the sharing of responsibility have the potential to both reveal how power shapes what we do as teachers and as learners, and also to support an analysis of the roles of power in such educational settings (Siry and Zawatski 2011). In doing this in our own course, we were able to explore the possibilities for a course that was driven primarily by the needs of the participants, yet one that still needed to function within institutional expectations (particularly those for demonstrating progress towards meeting state teaching certification requirements). Such conversations were frequent in our course within the weekly cogenerative dialogues that we had, and within this process we drew direct connections to participant’s future roles as teachers of science within institutional expectations.

### The school and the participants

This study took place at the Alexander Bell Community School,<sup>3</sup> in metropolitan New York. This urban elementary school is for grades K to 5, and there are approximately 500 students. The school is designated as a Title 1 community school, as it meets federal requirements for schools serving low-income, high-needs students. There are various

<sup>3</sup> With the exception of references to the authors, all names are pseudonyms.

versions of community schools in the US, and this school is a *full-service* community school. This designation indicates that the school provides before- and after- school programs, family services, and has on-site health facilities, including medical, dental, and mental health services. This school also serves as a professional development school (PDS) for a private, liberal arts college at which during this research Johaira was a student, and Chris was a faculty member.

Participants in this course during the fall 2006 semester included 25 children and 9 adults (7 pre-service teachers, the classroom teacher, and Chris). Johaira was a junior at the time, and it was her first methods course. She was invited by Chris to participate in data analysis and interpretation after the course had ended because she openly expressed her concerns about her abilities to teach science to young children in the beginning of the course, and in the unfolding of the course she was consistent in revisiting these concerns and discussing the ways in which she felt she was changing. As we present in the coming data analysis, she came into the semester expressing her significant hesitations towards teaching science to third grade students, and her evolution through the semester was evidenced by her frequent and open discussions within cogenerative dialogues about her successes and challenges working with the children.

### **Our research approach**

We have conceptualized our joint research as telling a story of Johaira's perspectives on her experiences in a field-based science methods course. This narrative is told through her lens, and we combined an empirical focus with a narrative writing approach. The main question that guides this work is: what role did participating in a collaborative field-based course have in Johaira's evolution as a teacher? In approaching this broad question together, we have asked epistemological questions about how her thoughts about teaching, learning, the nature of knowledge, and the relationship between knower and known, shifted and changed as Johaira evolved as a teacher of science. We also ask interconnected ontological questions, as we examine the extent to which she transformed in her identity-related perceptions of herself. We have examined the ways in which her valuing of science has shifted, and how her considerations of what is valuable in teaching and learning have changed over time.

Identity is lived, and a phenomenological approach enables us to examine how Johaira experienced her world and what it was like to be in her world. Lived experience is the starting point and ending point of phenomenological research (Van Manen 1990), and this approach enables us to ask *what is happening* as related to Johaira's interactions and experiences as a member of a collaborative field-based methods course. Through this phenomenological lens, we ask this question after the moments. Once events have passed we are able to turn back on them and reflect, recognize, and identify the experiences and the meanings we ascribe to them (Schutz 1967). Johaira described the experience of her everyday life as a participant in the field-based course in a variety of ways; she spoke of her feelings and beliefs during the course, remembered specific moments after the course had ended, and recalled moments when they were being viewed on video. This phenomenological approach allows us to consider her experiences being in the world, and being with others, and to present life as close to how Johaira has experienced it in the context of a field-based methods course as possible. Through the analysis of experiences throughout the semester, we have come to understand how her social reality as related to her identity as a teacher of science was constituted in the experiences she had coteaching science and cogenerating dialogue around the teaching of science. We present her lived, embodied experience through the lens of narrative description and

analysis. In this phenomenological exploration of Johaira's experiences, we make evident the ways in which having ongoing opportunities for reflexive practices of coteaching and co-generative dialogue supported her as she experienced transformative moments. To that end, we employ cowriting as a technique.

### Cowriting about identity transformation

This paper has been structured to reveal the layers of the process of cowriting. We have written around specific vignettes from the course, so that what follows is a combination of empirical data from video vignettes, Johaira's narrative recollections of specific moments, more current responses to these moments, and our shared writing. Thus, there are four layers to this paper. First, there are the transcripts from the course itself (labeled as episodes 1–8). Second, there are Johaira's immediate responses to the transcripts (prefaced with her first name represented in *italic font*). Third, there is Chris's writing that serves to theorize and summarize the shared analysis and interpretation of moments that Johaira has identified as salient to her development as a teacher. Fourth, there are Johaira's reflexive recollections of specific moments or responses to the written analysis (as a voice-over in right-flushed text boxes). This fourth layer is a distinction from the immediate responses that are prefaced with her first name, as the fourth layer is removed in time from the second. "Meaning is different depending upon the temporal distance from which it is remembered and looked back upon" (Schutz 1967, p. 74). This four-layered writing has been developed to account for the temporal nature of research that unfolded over 2 years. Photos are included to provide a visual sense of the vignettes. An additional distinction in the writing format is that while much of the interpretation is written from a voice of "we," there are occasions where we needed to distinguish between our individual and our shared perspectives and at those points we refer to our first names.

The structure of collaboration and shared responsibility for teaching and for learning creates opportunity for extensive dialogue around the processes of teaching and learning, both at the elementary level and at the college level. Through these cogenerative dialogues, Johaira's emerging understandings of teaching and learning science were revealed on an ongoing basis. After the completion of the course, we had numerous conversations about the outcomes that were evident in video, and we chose to develop a cowriting plan that uses shared writing to examine the identity and shifting understandings of science. The shared experiences in the course coupled with the shared experiences cowriting created what Schutz (1967) has termed a "we-relationship" (*Wirbeziehung*), which emphasizes the "unique connection between observation and social relationships" (p. xxvii). We have found that in this process of writing together our we-relationship has evolved, and our individual perspectives have shifted, over time and with collaboration.

### Data analysis and interpretation

All course sessions and cogenerative dialogues were videotaped and digitized, and serve as the main data source. As identities are produced, they connect with success. In our work, we are examining identity as an outcome of participating in this course, and thus the focus of our writing is on the success or failure of the tasks that Johaira has set for herself, and that have been set for her as a participant in the course. As such, we focus on specific events within her life as a participant of a methods course that provided her with resources to understand herself differently. We have looked back to identify evident points of transition. In our analysis, we considered these transitions as moments where one or both

of us recognized evidence of the transformation of identity and shifting understandings of teaching and learning science. The analysis itself consisted of a recursive process of video analysis, individual reflection, and conversations between us. As we began recollecting specific experiences from the semester, we viewed videos from the elementary classroom and the college classroom to identify vignettes. After these were identified, Chris transcribed the video clips, and we each examined the transcripts individually and then together in order to explore our individual and our shared interpretations of moments in which we both participated.

### The complexity of teaching elementary science

Johaira began the science methods course with specific concerns about teaching young children, and particularly about teaching children science. Chief among these concerns was maintaining a sense of control and avoiding creating a mess. She expressed in the beginning of the course that if she came prepared with everything she wanted to say and do she would be able to keep the control that she believed is necessary, though she expressed a recognition of the need for flexibility as an elementary school teacher. Our science topic for this semester was water, and as we present in sections that follow, the thought of water spilling made Johaira feel incredibly stressed. Thus, we have chosen to focus our points of analysis on times in the course in which Johaira was faced with the possibilities of water spilling. While this might seem trivial at first read, we believe it is quite the contrary. Considering her experiences through this lens serves as a critical way to represent her transformation through the semester as it represents Johaira's shifting epistemological considerations of science, and her transformation as a teacher of science. As we explore through our upcoming analysis, for Johaira, before this course began, being a teacher meant maintaining order, and being a teacher of science implied transmitting a collection of facts. That is, she viewed science as a static field, and she viewed science learning as individually constructed. Additionally, her view of being a teacher did not involve science, and did not involve social interactions around science. In the following section we introduce Johaira and situate her and her perspective on teaching and learning when she first became a participant in the course.

### Introducing Johaira

**Johaira:** *I went to private school in the Dominican Republic, it was very strict...very strict...we sat in rows. We were not allowed to ask many questions. When we arrived at school, our uniform needed to be spotless. If you came to school with a drop of dirt on you, you would be sent home. And, you couldn't come to school late. If you came to school late, you got sent home. And it just really looked bad...if you did something wrong, you would have to be forced to kneel under the burning sun in the courtyard.*

Johaira's experiences as a child were very traditional and from her experiences she learned that the role of the teacher was authoritarian. Children were expected to be quiet and obedient. This led her to experience initial struggles with her thoughts on what it means to be a teacher and a learner in the US. As she mentions, students were not allowed to ask many questions in the classrooms

<p>On the first day of our class, I didn't understand what science is. I was like, <i>science?</i> I don't know anything about science. In fact, I hated science! I expected that we were going to have to learn and memorize terms.</p>
--

of her childhood, and this is in direct contradiction to what the children are encouraged to do in the lessons we were preparing. Chris noted during the beginning of the course that Johaira initially expected to be developing lessons that were focused on solely content transmission.

To further emphasize Johaira's expectations for her role as a coteacher in our course we have selected a vignette from our first visit to the elementary classroom. Each of the lessons that the new teachers developed followed similar formats, and began with children sitting at the carpeted area of the classroom while a pre-service teacher, Chris, and Mrs. Turner introduced the focus of the day's science activities. The children then went in small groups to explore the experiments, which were facilitated by the remaining pre-service teachers. Each lesson focused on a new property of water, including surface tension, adhesion, cohesion, buoyancy, and density, and incorporated concepts from the prior lessons.

After our first class visit to the third grade classroom, Johaira shared that she was asked a personal question to which she did not know how to respond. Chris had been working with children next to Johaira's table, and had overheard parts of the conversation between her and the children in which they asked her what it was like to live on a college campus. The following exchange occurred immediately after the visit, as we all went to an empty room to have a conversation about individual and collective classroom experiences.

### Episode 1

- 01 Johaira: And then at the end they, the children, were asking me questions and right when they were asking me about the college and I shared about my room, and that's when you [came over] ((points to Chris))
- 02 Chris: [That was] hilarious ((smiling and nodding))
- 03 Johaira: Because I didn't even know you could answer personal questions like that?
- 04 Chris: Oh sure, yeah ((nodding))
- 05 Johaira: But then they went ON and ON and they were like 'oh, can we go visit you?' and I was like 'well....'
- 06 Monica: That's funny, they can come on Tuesdays, a class trip ((laughs))
- 07 Johaira: But they KEPT asking me<sup>4</sup>

**Johaira:** *This experience at the beginning of the semester really helped me think about my own classroom and how much of my personal life do I want students to know. How much of it can be relevant or even help students in the class? When I had the students ask me personal questions, it was really not something I expected. But now that I know that students are interested in the teacher's personal life, I can choose what I want to tell them and set boundaries. In the science class I learned to tell the students that at the end of the experiments if we had time I could talk about other things, but not while we were actively doing science. I was not telling them I wasn't going to answer their questions but I was redirecting them to focus on what we were doing.*

We have chosen to begin with this episode in our introduction of Johaira because it is integral to explaining Johaira's expectations of being a teacher before these field-based

<sup>4</sup> We use transcript conventions utilized by Roth (2005) as follow:

01, 02, etc. are turns at talk  
 ((gestures))  
 CAPS for emphasis  
 ... for fading off  
 [ ] for overlapping speech

experiences. Through her initial interactions in an elementary classroom, she became aware of some of her expectations for dealing with young children. Children asking a teacher personal questions was in direct contradiction to Johaira's initial hierarchical notion of the relationship between a teacher and a student, in which students do not question teachers in any way. She articulates her surprise at being asked a personal question, and this connects to Johaira's initial perspectives about what it meant to teach science. Her considerations on teaching and learning science begin to change through interactions with the children and with the other participants in the course. The above reflection was Johaira's initial written response to the analysis of the first episode, and she discusses the experience of talking with the children helped her think about her role as a teacher and what personal information she wants to share with her students. She was clearly surprised in the moment by the children's persistence "*but they kept asking me*" (line 07), and in the text box on the right she thinks back in time to examine how she now sees that the relationships between teachers and students are not necessarily what she remembers from her own childhood. As she engaged in learning to teach science by enacting science teaching, her views of the role of the teacher began to shift.

I was so thrown off at that moment, because when I grew up, I didn't ask my teachers personal questions. If they shared something on their own, that was different, but nobody would dare ask the teacher anything. We would never ask because we knew the teachers would be offended if we asked. Now I see that it's a different relationship between teachers and students than when I went to school.

In the sections that follow, we show how the structure of this course allowed her to have repeated exposure to children through the teaching of science. In considering science teaching as cultural enactment, learning and teaching science are social and cultural acts. We seek to illustrate how participating in a collaborative field-based science methods course has provided support for her shifts related to the teaching and learning of science. Further, we intend to demonstrate how these experiences created opportunities for the production, reproduction and transformation of her identity as a teacher of science. Rather than show a gradual progression, we have selected examples from the beginning of the semester as she begins to become aware of her role as a teacher and the role of science, and we contrast these with vignettes at the end of the semester as she positions herself as a new teacher of science. The following section demonstrates her becoming aware of her own expectations for teaching science, and her shifting perspectives of teaching and learning science.

### Shifting perspectives of teaching and learning science

In the process of considering her identity development, we have noted that there are episodes in which we see Johaira becoming aware of facets of teaching and learning science that she was not aware of before this course. In this section we explore the ways in which during the first month of the course Johaira began to become aware of the unpredictability of teaching science, of her own expectations for order, and her reactions to children demonstrated on video.

#### Becoming aware of unpredictability

In the following vignette, Johaira is working with a group of children to examine the cohesive properties of water. There are cups filled with water that each pair of children are

sharing, and the children have predicted how many pennies can be added to the cup before the water tension breaks, and the water flows over the cup. As two children, Kiara and Steven, are adding individual pennies to their cup, the pre-service lead teacher of the day, Marilyn, comes by to observe the children's progress on the activity. In this vignette, we see Johaira's apprehension to have water spilling. This lesson was one of our first lessons with the children, and she later speaks about how she did not realize how messy water could be.

## Episode 2

- 01 Johaira: Wait, WAIT, wait. ((holds up her hand)) Draw how it looks. Draw on the paper how it looks. Look at it. DRAW the cup and LOOK at the water and DRAW how the water looks
- 02 Group: ((counting pennies as they go in a cup)) 23, 24, 25, 26, 27, 28, 29, 30, 31
- 03 Johaira: Put another one and then we're going to draw how it looks
- 04 Kiara: LOOK at it
- 05 Johaira: Uh huh ((nodding)). OK, OK, wait, WAIT, draw how it looks, draw how it looks. You gotta look down to see how, see? ((leans down and demonstrates looking at the water level))
- 06 Marilyn: ((walks over to the table and speaks to the group)) Did you draw how it looks?
- 07 Steven: It's HARD
- 08 Marilyn: Yes, it is hard, but it's nice, isn't it?
- 09 Johaira: WAIT, don't move the table
- 10 Marilyn: What happens, do you see the water on top? Look how high the water is. Doesn't the water go over the top? How do you think the water stays on top the rim of the cup?
- 11 Johaira: ((to Kiara)) You don't know?
- 12 Steven: Could we use all the pennies?
- 13 Johaira: ((to Kiara))What's the experiment?
- 14 Steven: 32
- 15 Johaira: 32?
- 16 Marilyn: ((to Steven)) Cohesion
- 17 Johaira: Oh, it's SPILLING, it's SPILLING
- 18 Steven: ((smiling)) Almost
- 19 Johaira: ((smiling)) Almost, yeah...((to Steven)) OK, so put the number. wait wait, that's it. Oh, that's it
- 20 Johaira: ((to Kiara)) Oh, that's it
- 21 Steven: 58
- 22 Johaira: 58? You can draw another picture of how it looks after
- 23 Kiara: ((lifting cup of water with pennies)) This is heavy
- 24 Johaira: No, no, no, no, don't pick it up, just answer the question
- 25 Steven: We're not going to spill it when we try to take them [the pennies] out
- 26 Johaira: No, I don't want you to wet the table ((shaking head side to side))
- 27 Steven: Oh, I know what we should do, we should use the droppers ((smiling))
- 28 Johaira: ((raises eyebrows and smiles)) Yeah, to take it out?

Johaira's comments clearly indicate her concern with the possibility of the water spilling. In fact, in four turns at talk she alludes to the possibility of water spilling (line 09 "WAIT don't move the table", line 17 "Oh, it's SPILLING, it's spilling", line 24 "No, no, no, no,

*don't pick it up*", and line 26 "*No, I don't want you to wet the table*"). Additionally, in four turns at talk she directs their attention to completing the data sheet they have been given by Marilyn (line 01 "*Draw how it looks. Draw on the paper how it looks. Look at it. DRAW the cup and LOOK at the water and DRAW how the water looks*", line 03 "*Put another one and then we're going to draw how it looks*", line 05 "*Ok, OK, wait, WAIT, draw how it looks, draw how it looks. You gotta look down to see how, see?*" line 22 "*You can draw another picture of how it looks after*"). We see that her identity as a learner and as a teacher is bound within how she thinks about the teaching of science and how she positions the role of the teacher (Fig. 1).

**Fig. 1** Episode 2, line 09—  
WAIT don't move the table



Johaira's conception of doing science in this setting involves maintaining order through a dry table, and completing the data sheets that Marilyn has developed at the beginning of the semester, and she held what Joe Kincheloe has termed, a one-truth epistemology that is not focused on "the production of knowledge, but the learning of that which had already been defined as knowledge" (2001, p. 117). She saw science teaching as the transmission of facts and information, and even with a "hands-on" experiment, she expected the children to follow the steps together, and to carefully avoid spilling by stopping right at the moment the surface tension breaks, in order to avoid spilling water. Spilling water and incomplete data sheets may not seem like a big deal to veteran educators, but to a new teacher it can be traumatic, and clearly Johaira was struggling with this in her initial lessons and in grappling with her assumptions of what teaching entails. We see in this episode that there is a contradiction between the enactment of culture from another field (Johaira's home expectations for order) and the classroom. This cultural misalignment between her expectations and the reality of the classroom presented a struggle for her in enacting the role of science teacher at that time. In fact, part of the title of this paper, "I didn't know water could be so messy", is from a comment Johaira had made after this episode, as she stated, quite frustrated, "*I can't believe how much of a mess they made with just water; I didn't know water could be so messy*".

However, despite the obvious discomfort that emerges for Johaira in experimenting with water in episode 2, this vignette also shows her beginning openness to Steven's comments about wanting to use droppers to remove water from cups (line 27 "*Oh, I know what we*



*should do, we should use the droppers*”). In response to his enthusiastic suggestion, Johaira raises her eyebrows and smiles at him and acknowledges his idea (line 28 “*yeah, to take it out?*”). She initially expected the children to be less independent in this activity, and to proceed in an orderly fashion. In such an ordered approach to thinking about the nature of teaching science, the children would add their pennies to the cups one at a time, and simultaneously. Clearly she was taken aback by the potential disorder of the children adding their pennies at different paces and until the cups were potentially overflowing. Steven suggests something that was not in the initial plan for the activity, and this presented a conflict, as not only is it a possibility that holds both promise for removing water, but it also holds the potential for water spilling. In the end, she was open to his idea. Identities can be considered to be subjectivities “that are multiple, conflicting and contradictory” (Philips and Carr 2007, p. 562) and this vignette demonstrates the construction and reconstruction of Johaira’s subjectivities, as she struggles between discomfort in possible water spilling, and the openness she is experiencing in considering Steven’s suggestion of removing water with a dropper. Steven is helping her craft her new self as her epistemological notions related to science teaching and learning are shifting. As they consider the idea of using the droppers to remove the water, she is able to take agency with Steven through the structures of this interaction and the new culture that is being shared.

### Becoming aware of herself

Several days later, our class had a cogenerative dialogue around these initial teaching experiences we had been having teaching water to third graders. The following vignette, episode 3, focuses on Johaira’s contribution to the conversation about things that had surprised the pre-service teachers in their initial science lessons.

### Episode 3

- 01 Johaira: I realized during the lesson one of my weaknesses, I’m very organized. To me, everything has to go like just so...there shouldn’t be spills, that just like throws me off
- 02 Chris: Right ((nodding))
- 03 Johaira: And um, well, my group, for the most part, I tried to keep it so that they wouldn’t spill anything and I let them know like, oh, you know, try to take care of your desk, and once the water spilled, I was like, NO!, and in my head I was like, NO! I thought like the lesson was over, like THAT’S IT! I felt like I was the worst teacher, cuz the water spilled
- 04 Chris: Oh no ((shaking head side to side))
- 05 Johaira: I don’t know, I have to have it just like that, that’s why my, the worksheets were going, because I feel that if you tell me go out and do this like it has to get like done. They didn’t necessarily have complete sentences, I just let them know you can just write whatever you feel. Or some of them, like even though they were working in groups, they did share the same ideas, they wrote different things, but that just threw me off, but that’s something that I know that I need to work on because if things don’t go a certain way I’m just like... ((makes an expression to simulate frustration, raises hands in the air)), especially because if that was MY classroom I would have napkins ready to go, and paper towels, and so, me seeing that I was like, ugh

Johaira reveals her recognition of how unexpected things set her back (line 01 “*just throws me off*”) and she verbalizes that she is becoming aware of certain aspects of herself as a new teacher of science that she was previously not aware of in terms of how it might connect as a teacher. She had mentioned in other class conversations that she is very organized, and we all discussed some of the different issues of classroom management in elementary school and how organization can be important to establishing smooth transitions for children. In the above vignette however, we can see how her need for organization and planning can be distracting and even stressful to her as she maneuvers the teaching of science and the uncertainties involved in inquiry with young children. Further, Johaira grew up with high expectations for order and cleanliness, which connects directly to the conflicts she experienced in these vignettes in which the complexity of the classroom prevent the order she expected. The cogenerative dialogue became a structure for the development of her reflexivity, as she reveals that her focus on organization needs to be reconciled and she is motivated in this by her desire to be a successful teacher (Fig. 2).

**Fig. 2** Episode 3, line 05—because if things don’t go a certain way I’m just like...



Our analysis of episode 3 created an interesting research contradiction for us, and reinforced the importance of having multiple perspectives in interpreting data. Chris remembered this episode, and when the collaborative research began, brought it to Johaira. When Chris viewed this video, she was struck by what she perceived as Johaira’s courage in revealing her stresses to classmates that she was not familiar with. This conversation took place within the first month of the course, and relationships were just beginning to be established. For Chris, to discuss such dilemmas openly with people who were almost strangers was very brave, as she herself finds it difficult to reveal worries to those that she is not deeply connected to, and she tries to show the “best face” to those who are not known. For Johaira, however, it is much easier to talk to people who she does not know than to those that she does know about her concerns and perceived

When I don’t know people, it is easier to talk about things like what I think is a problem for me. I think that when I know certain people, I feel like they are judging me somehow. But if you don’t know them, then it is a different matter. I can go up in front of people I don’t know, and it’s easier than people who know me, because those people could ask why did Johaira do this? And they are going to judge me, automatically.

shortcomings. This contradiction between how we each view a moment like that one is salient to considering cowriting relationships. Had Chris written this as a lone researcher, she may have interpreted Johaira's comment much differently than Johaira experienced it. This is evidence of the importance in working towards not only a polyvocality in which there are many voices represented, but finding ways to work towards a polysemicity that reveals multiple perspectives and thus emphasizes different ways of interpreting the same moments.

One of the goals of this field-based course is for new teachers to be able to work with children, in order to experience the ways that children talk about science and interact around science. Thus, a key piece of this field-based experience is to begin to discover the complexities of relationships in the elementary classroom and examine how they are enacted in the learning and teaching of science. What has emerged through the unfolding of this course through the years is that pre-service teachers begin to understand the unpredictability of teaching science to young children. Johaira began the course concerned about how to handle messes created through the children's experimenting, and the unit on water became an opportunity for her to examine her expectations for teaching and learning science in elementary school.

### Becoming aware through video

In the previous two vignettes, we have emphasized how Johaira became aware of the unpredictability of teaching science as well as how she became aware of how this conflicted with her own expectations. In this next vignette, we explore how she further became aware of classroom events through the use of video clips of her own teaching. Video is an integral piece of this course, and all pre-service teachers receive video clips from their classroom teaching. Video serves as a mediating tool for pre-service teachers to review and examine classroom events, and provides for reflexive analysis and an opportunity to investigate the complexities of classroom teaching. In this course, using video structures the cogenerative dialogue, and provides a resource for developing reflexivity. In the previous episodes, Johaira began to realize her own expectations for order in classrooms as she struggled with the possibility of water spilling in the coteaching of science, and also as she reflexively considered this struggle within a cogenerative dialogue. In this following vignette, we layer upon her becoming aware of her own discomfort the ways in which video provided her with a lens to become aware of how others might see her, particularly the children. In the following episode, Johaira began to become aware of her body positions and her discomfort that is visible to people looking at her. As Chris explains and demonstrates to the pre-service teachers about how and why they are using video to analyze the lessons, we were gathered around a laptop, looking at an example of Johaira's interactions with her group of students during the activity in which the children were counting how many pennies could go into the cup of water before the surface tension broke.

### Episode 4

- 01 Chris: I am burning these clips to cd for you guys, and then you can see the lessons and we can talk about it. Here we can look at one of the smaller clips of Johaira's group
- 02 Johaira: ((tilts head, looks at screen, smiling))
- 03 Chris: So, ((to Johaira)) you just asked a really good question there, that's something we can look for in the videos
- 04 Johaira: Oh! ((watching)) NO! ((laughing, shaking head))
- 05 Chris: ((group laughter)) You are like, oh NO, the water's gonna spill

- 06 Johaira: ((smiling)) I think I do that a lot, I step back, and I'm just like this ((rolls eyes, leans back in chair)) while they're all working
- 07 Chris: Are you catching your breath?
- 08 Johaira: Oh my god, yes
- 09 Chris: Sometimes we do things like that without meaning to maybe...
- 10 Johaira: I know, but I didn't know you can see it! ((group laughter))

**Johaira:** *Video gave me a chance to step back and re-experience the moment through a different lens. I would have never remembered that I rolled my eyes and leant back like that but it is important that teachers work on those types of faces because students might interpret what they see. I definitely think that this was a day I was not feeling my best and so you could see that reflected in my face.*

In this section, we have explored three episodes related to the coteaching of the surface tension activity. Together, they reveal Johaira's initial expectations of teaching and learning science, as well as how these perspectives began to shift. The coteaching of the surface tension activity with her group of students highlights the complexity of teaching science to young children. In the planning of this lesson, Johaira had expected that the children would follow the steps of the activity so that as a group they together would each count the pennies as they put them in the cup carefully. As she participated in cogenerative dialogue after this activity, she was in a position to work out her feelings on the unexpected stress of the unpredictability of children's science investigations. In this last episode, she is able to see how her discomfort was visible in her body movements as she leant back and rolled her eyes. We have identified this episode as a turning point for Johaira in her awareness of herself. The purpose of using video in this way is for participants to become aware of things that might have passed unnoticed in the classroom. Once she saw herself on video, she "let go" more, as video enabled reflexivity and an awareness of how she is viewed by others. Within this structure of the course, she engaged in a reflexive process that supported a developing understanding of how she appeared at the moment and enabled her to consider how she wanted to be perceived by students, as she reflects above "*it is important that teachers work on those types of faces because students might interpret what they see*".

### **The transformative potential of shared teaching**

The initial episodes to this point present Johaira during the first 5 weeks of the course. We contrast these vignettes from the beginning of the semester with several that represent Johaira during the last few weeks of the course as they demonstrate Johaira's transformation as an elementary teacher of science. As we explore these, we will present our interpretation of the aspects of her experiences within the collaborative, field-based course that served to mediate her identity transformations and support her shifting epistemological and axiological views on science.

#### **Becoming a teacher of science**

Properties of water and how things interact with water can be abstract concepts, and the pre-service teachers struggled to develop lessons that they felt would be engaging, concrete, and valuable to the children. While the responsibilities for planning the lessons and

for teaching the lessons were shared by all participants during the semester, each pre-service teacher was responsible for their “own” lesson, and Johaira’s particular area was to focus on sinking and floating. The children had done a unit on this in Kindergarten, and in third grade Mrs. Turner wanted to ensure that they began to experience some of the concepts again in order to build upon and clarify their scientific understandings of water.

As Johaira was planning her lesson, she chose to focus on buoyancy, and she often mentioned to the others in the cogenerative dialogue group that she wanted it to be fun, but she wanted to make sure the children learned specific content during the lesson. In the following vignette, she has returned from meeting with the classroom teacher to finalize the lesson’s activities, and begins to explain the sequence and purpose of her activities to the group. The previous lesson was a lesson that focused on surface tension, and children experimented with several items, including paper clips.

### Episode 5

01 Nancy ((points to item in Johaira’s hand)) Is that one of the things you will give them to investigate?

02 Johaira: ((holding up a sponge with a hole cut out of the center)) Yeah. Um, one of the things I did, I don’t know if this question came up in your groups, or if your kids noticed this with the paper clip. So, I asked them in my group, why do you think the paper clip sinks, and they said that its because it has a big hole in the middle. So, I want at least the kids to understand that even if things have holes in the middle it doesn’t mean that they’re gonna sink cuz it has holes. That’s why I cut holes in the middle, so they can see that.... It’s also because of buoyancy, and I want them to see things displace water, or don’t

**Johaira:** *This was an important lesson for me as a pre-service teacher because I learned that as we move along in a unit we must make certain adjustments that go with the inquiry students are developing so that they are really learning what we hope they will learn. Cutting the holes in the sponges helped students think about connections to the paper clip, and having the opportunity to work with children in a small group helped me learn that.*

*As a teacher it must be hard to learn the things students are thinking because they are not part of the assessment. I noticed when we were in small groups students would always speak about what was going on, but when we went to the rug only one student would participate in the whole class discussion. This is why it is extremely important to work in different small groups so kids have a chance to talk more about science.*

In the beginning of the semester, after the first experience working with children, Johaira had expressed that she was coming to realize that one of her weaknesses is that she is highly organized and needs to have everything organized (episode 3, line 01 “*To me, everything has to go like just so...there shouldn’t be spills, that just like throws me off*”). She said that she gets nervous when water spills, and was not sure of how to handle it with children. In this vignette, however, we see her transitioning, as instead of being concerned of what will happen with the water, she focuses on how to help students explore solutions to questions that they had asked in previous lesson activities. This is a significant shift in her perspective of her role as a teacher, as her concern has shifted from the management of supplies and avoidance of a mess to the facilitation of activities that connect to students’ questions from previous investigations. Her identity and her epistemological stance on teaching science is evolving, as knowledge is starting to be viewed as something that is

emergent. She and her classmates had been coteaching and cogenerating dialogue on teaching and learning science for 2 months by this point. Through coteaching in the same elementary classroom over time, Johaira developed understandings of how children might need scaffolded experiences to help them clarify their own understandings of science concepts. She began to respond to things that came up in her group of students before the next cogenerative dialogue, and this is an indication of her increasing sense of agency. Within the cogenerative dialogues she has the space to share her own ideas and explain to the others why she has made particular choices; both *what* she can do as a teacher, and *why* she has done it. The very idea that she can do things herself (as a teacher) is very different than what she imagined her participation as a student in a course would be (Fig. 3).



**Fig. 3** Episode 5, line 02—That’s why I cut holes in the middle, so they can see that...

Participating in the shared activity of teaching over time supported Johaira in confronting her epistemological assumptions about the nature of teaching and learning, and in developing a sense of self as a teacher of science. May May-Hung Cheng (2005) has written about learning to teach, and posited that “the professional knowledge of teachers is shared among members of the profession as an outcome of human social interactions.” (p. 349). Johaira’s supported interactions with children and with other teachers over the course of a semester allowed her to participate in a way that she could consider her role as a teacher in episode 5 in a new way. She was able to plan her upcoming activity for the children in a way that considered their making sense of the science without obvious focus on potential disorder, and as such she could produce culture successfully.

We see further evidence of Johaira’s transformation to being accepting of having students experiment despite the unpredictability and potential messiness in the following vignette, which took place 10 weeks into the semester. Johaira is teaching a small group lesson on temperature, and the children are manipulating the temperature of a cup of water by adding hot water and ice cubes at various points. One of the children, Kara, spills her cup of water immediately. At a previous point in the semester Johaira had said in response to a similar situation in which water spilled, “*See? That’s because you were not careful. Now you don’t have any water.*” At this point, however, the following exchange occurred as the cup of water fell over.

## Episode 6

- 01 Johaira: Oh, get up, get up, get up  
 02 Kiara: Mrs. T!  
 03 Johaira: ((to another child)) Go get a paper towel please  
 04 Chris: ((walks over)) Do you need paper towels?  
 05 Johaira: Yeah  
 06 Chris: It's ok Kiara, that happens  
 07 Johaira: It's ok, it's gonna dry up, she's gonna bring a paper towel, 'kay?  
 08 Chris: So Kiara, do you need more water in your cup?  
 09 Kiara: ((nods))  
 10 Chris: ((leaves to go get more water))  
 11 Kenny: What happened?  
 12 Johaira: Nothing really, we just spilled some water. It's ok Kiara, ((holding paper towels out)) Do you want some to dry your pants? ((Helps her dry her pants)) It's ok, we'll leave it here and you can dry if you need to later

**Johaira:** *By this point I felt comfortable enough with my surroundings, and with myself as a teacher, to know what to do. I definitely felt more calm. I felt as though I couldn't make a big deal out of the situation because then it would have affected Kiara's learning. I did not want it to be a distraction. As a matter of fact I remember telling her that it was okay because scientists make mistakes as well. This was a lesson I first had to learn for myself! I was able to learn this because we had the chance to meet at the College to discuss our concerns. I feel as though without these experiences talking together I would not have reacted the same.*

Episode 6 represents Johaira's developing understanding of the complexity of teaching, as she is able to help Kiara in spite of the fact that water has spilled. Episode 6 emphasizes her shifts towards teaching science, as she is learning to adapt and enact the teaching of science. A key component of coteaching is that each participant supports the other in the process of teaching science and shares responsibility for the success of the lesson. In this episode, Chris comes over when the water has spilled and says to Kiara "*it's okay Kiara, that happens*" (line 06), and Johaira reassures Kiara with "*it's ok, it's gonna dry up, she's gonna bring a paper towel, 'kay?'*" (line 07). As the interaction continued, a boy in the group named Kenny noticed the spill, and asked "*what happened*" and Johaira calmly responded "*Nothing really, we just spilled some water*" (line 12). Through prolonged engagement coteaching over time in the same classroom, she has become able to develop science activities as well as a comfort with teaching. After the water spilling in episode 6, Johaira goes on to continue the lesson, and jumps right back to where the group had left off. Kiara joins the group in continuing the investigation, but it appears that she is not as engaged as she had been as she has stopped participating in the conversation around the experiment. At the end of the activity, as Kiara hands Johaira her data sheet, Johaira sees that she has written "I'm not having fun" on the top of her sheet, and the following exchange occurs:

## Episode 7

- 01 Johaira: ((reads data sheet, turns to Kiara)) Why aren't you having fun?  
 02 Kiara: [inaudible]  
 03 Johaira: But that's okay, I always get water spilled on me, and it's okay  
 04 Kiara: [inaudible]

- 05 Johaira: ((laughing)) You're going to ask Chris if it's ok? What do you think she's going to say?
- 06 Kiara: [inaudible]
- 07 Johaira: ((laughing)) It's what scientists do sometimes. Sometimes they have to get wet, sometimes they have to get dirty. You're okay because it's drying off. Look, it's not as wet. ((hands her more paper towels and makes a dabbing motion)). Here, just go like that
- 08 Kiara: ((erasing data sheet))
- 09 Johaira: ((smiling)) You're gonna change that? I'm glad. ((watches Kara writing)) You know what you could write too?
- 10 Kiara: Cuz it's ok to get wet ((nodding))

**Johaira:** *One of the things that I learned from coteaching on an ongoing basis with Chris and my class and Mrs. Turner is that it is important that teachers know that part of teaching science is creating an environment where students feel comfortable to conduct experiments. Part of this is for them to know that they are doing science, and that means sometimes getting messy.*

Johaira evidences an epistemological shift as she allows the knowledge of science as it is lived, evidenced in the statement “*It's what scientists do sometimes*” (line 07) in her dialogue with Kiara. Knowledge and learning as she now frames it is a journey that may not be linear, and are also not *clean*, symbolically or practically. This contrasts sharply with her initial expectations of rows of desks and the teacher controlling both the content of knowledge and the method of its transmission. Science in her early teaching and student experiences was *known*, and in these teaching episodes, science is something that is lived and experienced.

Johaira initially expected that teaching science consisted of following step-by-step procedures. “Models of teaching that assume that teaching consists of set of conscious decisions may inadvertently lead to inappropriate ways of planning and then enacting teaching” (Tobin and Roth 2006, p. 45). As she confronts her initial expectations for teaching, she is able to become fluent in enacting science teaching as seen in episodes 6 and 7. In fact, we position these two episodes as critical in considering Johaira's changes during the semester. She had come to a point in how she views science learning that she was not only comfortable with the fact that the water had spilled, but she extended that comfort to the children, and together they were able to work towards attaining the goal of conducting science experiments without being concerned about possible spills. Johaira had within several months transformed from initially being upset and stressed by water spilling, to being comfortable with it herself and further trying to assure the children that it is not important if the water has spilled. She connected her considerations for the student comfort with her own comfort, and was able to begin to afford Kiara's openness to accepting the spilled water. These transformations

Now that I think back to the environment of the classroom I think that I would have felt even worse if the room we were in was spotless. Teaching in that specific classroom taught me that messy classrooms can show evidence of learning. As pre-service teachers we think too much about how we are going to set up our own classrooms. In fact we seemed to be very judgmental in our management class about the way the classrooms we observed looked. Now I see the difference between being well-organized and allowing students to experiment even if it means we might have some mess here and there.



occurred within the agency | structure relationship, as Johaira gained agency as a new teacher through her participation in coteaching and cogenerative dialogues. Within this, she also revealed an openness, as she became receptive to learning from the others and from our experiences.

Her awareness of her changing comfort towards unpredictability is revealed in the following vignette from a cogenerative dialogue that occurred after the last science lesson in the elementary school. As we are all discussing what we each found to be successful or challenging during the semester, Ellen, a pre-service teacher, comments on the lessons, and refers to the lesson that Johaira had planned. That particular lesson had been the first lesson of our unit where the children had an open container of water and it was the first lesson where there was much left to the students to experiment and determine.

### Episode 8

- 01 Ellen: I liked Nora's the best of everybody's. It worked the best for my table. They were excited about it and excited about what they were doing, like they were with your lesson ((points to and looks at Johaira)) but it was without all the MESS ((smiling))
- 02 Johaira: ((smiling)) It's funny, because I am like THE most organized person ((group laughter))
- 03 Ellen: That IS funny
- 04 Johaira: And it's funny because in the second part of my lesson, I was like, you know WHAT, they don't have to use a worksheet! ((laughs)) They can do what they want and experiment which type of boat they want to make, and like, whatever. So, that's one of the things that I try to do with this class, just like LET GO and be like, oh YEAH, get messy, experiment, let things spill, but like, it's crazy hard for me sometimes

**Johaira:** *Surprisingly enough my lesson was the messiest out of the bunch, and this was the lesson children really enjoyed doing. At the end of my lesson I really felt satisfied even though some of the girls like Ellen did not agree with how it went. I was confident enough that this comment did not bother me. I think that we had established a dialogue environment that was strong enough that at the end we did not hold grudges. The discussion with our group also showed me that not everything works for everybody. But I think teachers should be ready to do anything, messy or not, and make the lesson work for the students, even when the lesson has already started. I know that one of the problems with using the clay was that it began to come apart very fast. I think that if the teachers actually got dirty and helped the students then they would have found ways to fix the problems.*

This is an identity shift, represented by how she was not bothered by the comment because she understands the definition of knowledge and of teaching differently than when the course began. Johaira speaks of her confidence, and being confident can be a valuable tool in becoming a teacher. Further, in addition to confidence, her thoughts on what it means to be “wrong”

With Ellen saying that, I also felt that, when I did the lesson, I didn't do it for them, I did it for myself. I do certain things to make it interesting for the kids, but it's not going to work for every teacher, so we could be teaching the same curriculum, but we could each teach it differently, and that is ok. I think that is what I've really gotten from this class, and from thinking about science teaching and learning –I can be doing something at my table, and I would look at Tracie and I would notice she is doing it differently, and I know now that is ok.

have changed. Her messy lesson was not “wrong”, it was a part of the process of teaching. As she has developed identity associated with a group, she felt supported in taking risks in the classroom, and in openly and reflexively discussing issues around the teaching of science. As the participants of the class have collaboratively constructed meaning, their identity became transformed through mutual co-participation. This reinforces perspectives of learning to teach as a “a process of socialization or enculturation, leading to shared professional knowledge through human interactions” (Cheng 2005, p. 356). Working together in shared practice created opportunities for individuals to create their understandings of the teaching and learning of science.

Through these contrasting representations over 8 episodes, Johaira’s transformation is evident, and it coheres through the support that comes from sharing experiences in the classroom and reflexively discussing them with her colleagues. In being in the classroom with the support of others, she became more comfortable with water, and was able to engage students in learning. This identity is very different from the one she came into the class with, as is evident both in her discussions about her own experiences as a child as well as her concerns about teaching. What we see her saying is that is acceptable to not have control over all the events in a classroom, and this is something she has learned in part by seeing that people in the same classroom can approach teaching differently. Her understandings of what science is have shifted, and this challenged her preconceived notions of science as static and factual, and science teaching as traditional and authoritarian. Further, as she moves towards a comfort with the unpredictability of science, she expresses confidence in herself as a teacher of science. In the following section we examine ways in which the course structures supported this transformation.

### Mediating identity transformations

In thinking about the identity transformation that can be possible through coteaching in a field-based setting, we have chosen vignettes that illustrate a transformation of Johaira through the semester through contrasting with her at the beginning of the semester with the end of the semester. We believe that these episodes provide evidence of ways in which she has developed an understanding of the messiness of science, the complexity of teaching, a need to *see* science, and how her initial expectations and what she experienced were two different things. Participating in a field-based setting and being supported through cogenerative dialogue have been critical to Johaira’s transformations to being a teacher of science. Cotaught and co-developed lessons with third grade children provided support and opportunity for Johaira to develop her understandings of the complexities in elementary science teaching and learning, and she developed her comfort with science as a content area and a way of thinking about the world. Sharing responsibility for the teaching and the learning of the methods course contrasts sharply with what Kincheloe has referred to as “more traditional and technical forms of teacher education that conceptualized teaching as a set of skills-not a body of knowledge” (2004, p. 27). In our experiences, science teaching and learning are framed as epistemological, as through the course we are able heed Kincheloe’s call to

After the semester, I left, and you know what? I love science! Isn’t it funny, to change so much in one semester? You know, in school as a kid, I really hated science. Until this class, I didn’t even understand what science is about. Now I know that the process is really important too, not just the terms and facts. And I know it can be fun to do science too.

analyze “the epistemological and other types of tacit assumptions embedded in and shaping particular articulations of practice” (2004, p. 27).

Johaira's agency was expanded by structures within the course, as well as her own receptivity. Structures in this course that were pivotal to Johaira's emergence as a teacher of science through the semester were primarily related to the opportunity to participate in supported science teaching and ongoing interactions with young children in a classroom setting. These experiences were what April Luehmann has referred to as “low-stakes” or safe teaching situations (2007) in two ways: first, the pre-service teachers were not graded on their teaching interactions in any way, and second, there were many other teachers present in the room if anyone needed help either explaining a concept or an investigation or with management of a group. These low-stakes interactions provided Johaira with the ability to take agency in several facets in the vignettes presented herein. For example in episode 5 she expressed her desire to develop an activity that will be most relevant to the children. Her expanded agency allowed her to provide support to Kiara in episode 6 and 7, and also to openly accept critique from a colleague in episode 8 and participate in a discussion around Ellen's comments towards Johaira's lesson. As she experienced expanded agency, she took risks, and had opportunity to learn about the complexity of teaching and learning science. Within this agency | structure relationship, her epistemological perspectives and science teaching and learning changed, so that she began to think of science as open-ended. In considering agency, we must also consider the ways in which Johaira needed to be receptive to learning from others in the group, and learning from the students. Coupled with the opportunities to “step-back” in cogenerative dialogues she was supported in expanding her teaching practices and her thoughts on what it means to teach science. As her epistemological perspectives changed through the process of participating in science teaching with others, her identity, as something that is social, fluid, and distributed, shifted with her experiences and reactions to those experiences and to the others who were there with her. As such, her identity as a teacher of science was produced, reproduced and transformed within the agency | structure relationship.

## Closing thoughts

**Johaira:** *I think that sometimes it is fear that drives teachers away from teaching science. Because we had the opportunities to teach science together in that environment, we were all confident in teaching the subject. There isn't much push for students to learn science these days. Teachers need to begin to change that. Everything we do is science.*

*The science class was a learning experience not only for me but also for the students doing experiments for the first time. I really began to look at science more than just reading information. When I was in school we did not ask our own questions; we took the information as it was. Showing students the importance of questions is very important because it allows them to see the process and helps them build on their learning. On my part, I saw science as a way of understanding education itself as a process. There are many ways of teaching, and there is no correct way of doing something as long as you obtain the same result—learning. Before taking the class I was too focused on the goal and not on the process, so I would be nervous going in. However, knowing that there can be so many variables prepares me to take more chances.*

In the process of actively participating in a field-based science methods course, identity was produced, reproduced and transformed in an ongoing process, as Johaira engaged in

opportunities that structured her experiences and supported her in making her own unique contributions to the course. The transformations that Johaira experienced came in part from her expanded agency, which allowed her to meet her goals and build an identity that is associated with the teaching and learning of science. Additionally, she was receptive to learning from the others; children and course participants, and participating successfully in the culture of science teaching and learning enabled her to move beyond her initial hesitations.

Johaira entered the course with traditional views of teaching and of learning that held knowledge as authoritative and fixed. Her preconceived notion of what science is was that of static facts and texts to be read. Evidence of her shifting expectations of science teaching and learning has been provided through vignettes and Johaira's reflections that demonstrate her intertwined shifts. Her view of teaching science has changed from traditional lecture time to innovative open experiences. Being able to examine her epistemological perspectives on teaching and science has been instrumental to her identity as an elementary teacher of science. As her knowledge of teaching science and her comfort with teaching science increased, so did her connection to science teaching and her views of herself.

Further, Johaira entered the course determined to be successful, despite her open and significant hesitations. Her transformed identity allowed her to participate successfully in the field-based experiences. Roth and Tobin have written that "in each situation of their daily praxis, students (and teachers) are involved in the struggle of making and remaking who they are, how they understand themselves, and how they are understood by others" (2007, p. 14). This making and remaking is not a simple process. It is complex and interconnected with social relationships with others, and participating in ongoing activity. For new teachers, their sense of themselves is further shaped as others see them as teachers and treat them as teachers. In exploring the connection between identity and participating in social and cultural practices, Na'ilah Nasir and Victoria Hand write that "...it is likely that in practices in which an individual feels this sense of closeness, is that he or she is more likely to be more engaged. That is, the person is more likely to participate more extensively and more intensely" (2008, p. 147). Considering these connections more in teacher education may lead to greater engagement for pre-service teachers in their teacher education practices.

In the activity of participating in coteaching and cogenerative dialogue, Johaira was able to develop an understanding of herself, and her history, and thus her positionality as a teacher. We have highlighted Johaira's identity as it was continually produced and transformed through the process of reflexively participating in classroom life, which we see as key to her shifting identity. In enacting science teaching with the support of her peers, she was able to develop understandings of the complexities in elementary science teaching and learning and she developed her comfort with science as a content area and a way of thinking about the world. Barbara Crawford has suggested that "one of the critical factors influencing a prospective teacher's intentions and abilities to teach science as inquiry is the teacher's complex set of personal beliefs about teaching and of science" (2006, p. 613). She was positioned to take agency through her experiences and reflections of coteaching, and her epistemological perspectives of science teaching and learning shifted. As such, her identity as a teacher of science was developed and as she concludes in her ending text box reflection, as well as in the reflection that we open the paper with, she developed an appreciation of science as a discipline, as well as of the importance of teaching science.

In contextualizing Johaira's experiences through her voice and perspectives within the ever-changing contexts of classrooms, we have sought to illuminate the lived experiences of Johaira in order to present an analysis of her transformation over time. "Most likely,

written word can never capture the full identity of a person or environment, especially if one believes that identity is a malleable, ever-developing, interactive construct” (Basu 2008, p. 862). Through cowriting, however, we have sought to reveal Johaira’s experiences as closely as possible through the use of a layered approach to writing this paper. We have used what Schutz has called a reflective glance, and have singled out “elapsed lived experience(s) and constitute(d) (them) as meaningful” (1967, p. 71). As we have progressed through this project, we have become aware of these moments, made them meaningful through looking back at them, and shared our meaning making with each other in conversation and through our writing.

## References

- Antonek, J., McCormick, D., & Donato, R. (1997). The student teacher portfolio as autobiography: Developing a professional identity. *The Modern Language Journal*, *81*, 15–27.
- Basu, S. J. (2008). Empowering communities of research and practice by conducting research for change and including participant voice in reflection on research. *Cultural Studies of Science Education*, *3*, 859–865.
- Cheng, M. M. (2005). Understanding teacher professional development during the field experience period using a sociocultural view of learning. *Teacher Development*, *9*, 347–368.
- Cook-Sather, A. (2006). Newly betwixt and between: Revising liminality in the context of a teacher preparation program. *Anthropology and Education Quarterly*, *37*, 110–127.
- Crawford, B. (2006). Learning to teach science as inquiry in the rough and tumble of practice. *Journal of Research in Science teacher*, *44*, 613–642.
- Danielewicz, J. (2001). *Teaching selves: Identity, pedagogy, and teacher education*. Albany, NY: SUNY Press.
- Enyedy, N., Goldberg, J., & Welsh, K. M. (2005). Complex dilemmas of identity and practice. *Science Education*, *90*, 68–93.
- Gee, J. P. (2000). Identity as an analytic lens for research in education. *Review of Research in Education*, *25*, 99–125.
- Henning, M. B., & Yendol-Hoppey, D. (2004). Context in methods course learning: Lessons for partnership work. *Teaching Education*, *15*, 401–416.
- Kincheloe, J. (2001). *Getting beyond the facts: Teaching social studies/social science in the twenty-first century* (2nd ed.). New York: Peter Lang.
- Kincheloe, J. (2004). The bizarre, complex, and misunderstood world of teacher education. In J. Kincheloe, A. Burszty, & S. R. Steinberg (Eds.), *Teaching teachers: Building a quality school of urban education* (pp. 1–49). New York: Peter Lang.
- Luehmann, A. L. (2007). Identity development as a lens to science teacher preparation. *Science Education*, *91*, 822–839.
- Martin, S. (2009). *Learning to teach science*. In W.-R. Roth & K. Tobin (Eds.), *The world of science education: Handbook of research in North America*, pp. 569–586.
- Nasir, N. S., & Hand, V. (2008). From the court to the classroom: Opportunities for engagement, learning, and identity in basketball and classroom mathematics. *The Journal of the Learning Science*, *17*, 143–179.
- Philips, D. K., & Carr, K. (2007). Illustrations of the analytic memo as reflexivity for preservice teachers. *Educational Action Research*, *15*, 561–575.
- Roth, W.-M. (2005). *Doing qualitative research: Praxis of method*. Rotterdam, The Netherlands: Sense Publishers.
- Roth, W.-M., & Tobin, K. (2002). *At the elbow of another: Learning to teach by coteaching*. New York: Peter Lang.
- Roth, W.-M., & Tobin, K. (2007). *Science, learning, identity: Sociocultural and cultural-historical perspectives*. Rotterdam, The Netherlands: Sense Publishers.
- Schutz, A. (1967). *The phenomenology of the social world*. USA: Northwestern University Press.
- Sewell, W. H. (1992). A theory of structure: Duality, agency, and transformation. *American Journal of Sociology*, *98*, 1–29.
- Siry, C. (2011). Emphasizing collaborative practices in learning to teach: Coteaching and cogenerative dialogue in a field-based methods course. *Teaching Education*, *22*, 91–101.

- Siry, C. & Zawatski, E. (2011). "Working with" as a methodological stance: Collaborating with students in teaching, writing, and research. *The International Journal of Qualitative Studies in Education*, 24, 343–361.
- ten Dam, G. T., & Blom, S. (2006). Learning through participation. The potential of school-based teacher education for developing a professional identity. *Teaching and Teacher Education*, 22, 647–660.
- Tobin, K. (2008). In search of new lights: Getting the most from competing perspectives. *Cultural Studies of Science Education*, 2, 227–230.
- Tobin, K., & Roth, W.-M. (2006). *Teaching to learn: A view from the field*. Rotterdam, The Netherlands: Sense Publishers.
- Van Manen, M. (1990). *Researching lived experience: Human science for an action sensitive pedagogy*. Albany, NY: SUNY Press.
- Wells, G. (2004). Narrating and theorizing activity in educational settings. *Mind, Culture, and Activity*, 11, 70–77.

## Author Biographies

**Christina Siry** is an associate professor of educational sciences: natural science didactics at the University of Luxembourg. She has several lines of research that focus on the intertwined areas of science learning and learning to teach science, particularly at the elementary and early childhood levels. Her work focuses on the necessity of incorporating multiple perspectives in research and on collaborative approaches to teaching and learning.

**Johaira Lara** is a 1st grade dual language teacher at Park Avenue School in Port Chester, New York. She is a Manhattanville College graduate in Early Childhood Education and Spanish. She is currently working on completing a master's degree in bilingual education from Mercy College. While on her path of becoming a master teacher, Johaira enjoys the everyday struggles of the classroom to better her teaching practices. "Teaching is hard work. Good teachers make teaching look easy".