The relationship between biology teachers' identities and their integration of the outdoors

by

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ABSTRACT

The purpose of this study is to explore the relationship between the identities of biology teachers and their integration of outdoor settings with their practice. In the context of this study, teacher identity is considered as enacting and being recognized as a particular kind of teacher at a particular time and place for pedagogical purposes while simultaneously co-constructed with discourse, socio-cultural-historical context, and practice (or activity). Additionally, outdoor education is taken to mean education about and for the outdoors, working in conjunction with indoor classroom instruction. The theoretical framework laid the foundation for the following research questions: (1) What is the relationship between identities of biology teachers and integration of the outdoors? (1a) In what ways does identity influence biology teachers' pedagogical decisions towards their outdoor practice? (1b) In what ways does biology teachers' identities and outdoor practice influence each other? The answers to these questions will help educators and others better understand the relationship between identity and teaching practice.

A qualitative, multiple case study design (n=3) was employed, and purposive sampling was used to identify ideal participants who are: secondary biology teachers in Alberta, have had more than three years of teaching experience, and who incorporate the outdoors with their teaching. Teachers began by completing an open-ended questionnaire asking about their outdoor teaching practices. Questionnaire results were used to generate questions for the initial interview and then those results were used to formulate questions for the final interview that was forty-five minutes.

Discourse analysis, with an emphasis on its social context and as a representation of teacher identity and context, was used to examine the transcripts. Results indicated key characteristics of their identity including: fulfilling curriculum, viewing teaching as helping

students, using multiple methods of teaching, valuing different aspects (ex. students, other learning settings, natural environment, and others).

To determine underlying coherences of these teachers' connections between identity and integration of the outdoors, a cross-case analysis was used. Big "D" Discourse was used as a framework to organize the cross-case analysis since it transcends small "d" discourse by combining those results with characteristics that extend beyond language such as attitudes, values, and others. Overall, there were two coherences: (1) these teachers appear to have a flexible view of teaching methods and learning environments; and (2) it seems that these teachers also implement the outdoors as a setting for developing students' attitudes. These coherences may contribute towards other ways of understanding biology teaching practice. Together, these coherences suggest a Discourse of flexible teaching and pedagogical practice so that it naturally includes the outdoors with science.

PREFACE

This thesis is an original work by Julieta de los Santos. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name "The identities of biology teachers who use outdoors in their teaching: Using discourse as a lens", No. Pro00021270, December 16, 2011.

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TABLE OF CONTENTS

LIST OF TABLES

Chapter 1

Research Introduction

1.1 Context of Study

Biology is the study of life, yet, this subject is frequently taught indoors. "The study of biology...is a living experience, and without fieldwork it can be (and often is) killed stone dead" (Association for Science Education and Outdoor Science Working Group [ASE OSWG], 2011). Learning in outdoor settings can contribute towards student engagement by furthering curiosity about the environment, offering other ways of learning science, linking science to the local community, "seeing" science in action, and other student benefits (Braund & Reiss, 2004). Although there are indoor activities that may benefit the same areas of student engagement, the indoor experience cannot be compared to the outdoor experience. Outdoor settings include natural habitats (freshwater habitats, residential field centres, farms), and constructed environments (botanic garden, zoos, museums, industrial sites) (Braund & Reiss, 2004).

While there is much potential in outdoor experiences for biology education, often, there is a gap between what is learned in the indoor classroom and what is learned outdoors even though outdoor education can complement indoor classroom instruction (Gallagher, 1991; Jordet, 2008). That gap is increased by a lack of consistent opportunities for students to learn outdoors. "Despite the strengths and advantages that fieldwork can bring to teaching at all ages, there has been a long-term and continuing decline [in the United Kingdom] in the provision and condition of outdoor education in science" (ASE OSWG, 2011).

To motivate teachers to use the outdoors, there are teacher resources available for professional support (ASE OSWG, 2011; Braund & Reiss, 2004; Foster & Linney, 2007). However, these resources may not be a complete solution. According to Barker, Slingsby, and

Tilling (2002), these resources are often limited in their scope. There is a need for resources that focus on using the outdoors in a variety of ways other than fieldwork, and in particular for resources that are applicable outside of specialist schools and science centers that endorse incorporating the outdoors.

In addition to lack of resources, many teachers are not able to take advantage of outdoor opportunities. There may be different reasons for teachers not integrating the outdoors. For example, in Powers' (2004) study of pre-service elementary education instructors' perspectives on integrating environmental education, it was found that some pre-service teachers are not inclined towards science or being outdoors. In contrast, Mirka's (1973) study found that teachers who did not use the outdoors were due to: not considering the school site as a learning setting; lacking knowledge for implementing the outdoors (this includes not knowing instructional activities for the outdoors, lacking curricular guides and materials, and not having access to resource people); and not valuing outdoor experiences for children.

Going further, beyond teachers' knowledge and comfort level, an important and essential avenue for understanding integrating the outdoors is to reconsider biology teaching from the perspective of teacher identity, i.e. the way that they understand themselves to be biology teachers and how that understanding may affect their use of the outdoors. That is, what sorts of understandings, values, actions, and activities are associated with teaching biology? As an example, Mirka's (1973) study also found that those teachers who integrated the outdoors did so because they: view the school site as a learning setting; value outdoor experiences for children; know how to integrate the outdoors (including applying teaching material to outdoor settings, planning and conducting outdoor activities, and having previous positive experiences outside); value the outdoors; and have a manageable class size. These can also be considered to be

elements in the way that biology teachers see themselves and their practice as well as how they are seen and understood by others. In other words, this factors could be understood as capturing some element of their identity as teachers.

1.2 Purpose of Study

This is a qualitative, exploratory multiple case study into the relationship between teacher identity and their practice of outdoor biology teaching, specifically, the way that the identities of biology teachers' guide them to include outdoor settings with their practice and how that practice may also feed back into their identities. By using more than one case, it is hoped that common coherences may be found among the teachers to better understand why some teachers are able to overcome barriers and make strong commitments to outdoor biology teaching. Those relationships will be explored through the relationships between discourse and identities of biology teachers using outdoor practice. Coherences across teachers will be further explored by examining the potential for common patterns of discourse and identity, which Gee (2011a, b) labels as Discourse. Is there a common Discourse of biology teachers who use the outdoors that may help identify how other teachers might be encouraged and supported in outdoor biology teaching?

The origins for this research topic arose from personal experience. As a former high school biology teacher, I was always surprised at the positive reactions from students whenever we used outdoor activities. I found my students to be more enthusiastic about their learning, more curious about the connections between science and the outdoors, and overall they had a greater appreciation of science. This led me to read the matching literature and I found that my experiences were commensurate with Braund and Reiss (2004), who found that learning in

outdoor settings had similar effects upon students. For example, each of those authors found out that the outdoor activities they incorporated had positively effected their students so that some had continued studying biology, others volunteered to help with future trips, and additional positive effects. Furthermore, they add that other teachers have had similar positive experiences when bringing the students outdoors. In addition, Reiss (2005) also describes learning science in out-of-school settings as an opportunity for students to develop a more realistic view of science. Additionally, I also reflected upon other biology teachers and the ways that they might incorporate the outdoors. I compared my outdoor experiences from high school biology classes to those from my undergraduate biology classes and realized that I preferred the university classes. This preference was due to active engagement with the environment such as, observing animal behavior in a natural environment and collecting micro-organisms from aquatic ecosystems, while in high school we had a passive engagement with the environment, for instance completing worksheets at the zoo.

Upon further contemplation, this led me to my research topic. I was curious about other biology teachers who use the outdoors in the way that I did. I wanted to know how their understandings of science, teaching science, and of themselves as science teachers influenced their practice, specifically, their integration of the outdoors. However, it was not outdoors for the sake of being outside (like my high school outdoor experiences), rather, it was to be outside while actively engaging with the environment in a way that was in accordance with and expanded upon indoor classroom lessons (Chapman, McPhee, & Proudman, 1992; Dewey, 1938; Woodhouse & Knapp, 2000). To describe teachers' professional view of themselves I felt that the concept of teacher identity was appropriate since it is a fundamental aspect of how they engage in teaching (Beauchamp & Thomas, 2009).

Yet, my research topic was incomplete since there was is no direct way to 'capture' teacher identity since it is intangible. An indirect method was needed. Because I wanted to know how teacher identity influenced their teaching practice to include the outdoors, I wanted to know the activities that teachers had already used, and their most memorable moments. To obtain this information, I felt that a semi-structured interview would be best since this would allow participants to share and elaborate upon their experiences. To analyze the interview data, I felt that discourse analysis was an appropriate method since it emphasized the voice of the participants, examined the way that language creates meaning, such as the way that the participants' language would represent their teacher identity, and provided rich description of their experiences (Cohen, 2008; Irwin & Hramiak, 2010; Munby, 1986). Discourse as an analytical framework allowed for exploration of a representation of identity.

Collectively, the theoretical framework, and the analysis (discourse) helped refine my research topic so that the research questions are: (1) What is the relationship between identities of biology teachers and integration of the outdoors? (1a) In what ways does identity influence biology teachers' pedagogical decisions towards their outdoor practice? (1b) In what ways does biology teachers' identities and outdoor practice influence each other? The answers to these questions will help educators and others better understand the ways that teacher identity guides practice as represented by discourse such as, biology teachers' identity guiding their incorporation of the outdoors, and to re-consider the relationship between teacher identity, science teaching, and the outdoors. Additionally, this research investigation provided an exploratory view of the connection between identity and practice, and the ways that discourse may represent coherences, such as a common Discourse, of teacher identity among a specific group of teachers.

1.3 Overview of the Dissertation

      This dissertation begins with context, significance, and purpose of this study. In Chapter 2 is a literature review to better understand what is meant by identity and outdoors within the context of this study. A theoretical framework that was used to guide this research is in Chapter 3. The methods of the process of this study can be read in Chapter 4. The following three chapters each represent results per case study in Chapter 5, 6, and 7, respectively. The final chapter explains the Discourse for each case study and a cross-case analysis for a common Discourse. Reflection upon the investigation and future research are also described.

Chapter 2

Literature Review

2.1 Introduction

My study examines the relation between the identity of biology teachers and their use of outdoor settings with their practice. For context, it is necessary to specify the way that the outdoors and identity are referred to within this thesis. The following sections pursue this discussion by first examining the outdoors, then identity.

2.2 Outdoor Learning

This study engages with the outdoors as both a concept and context of science education. It is important, however, to clarify the terms being used to describe that relationship.

Because this study explores the relationship between identity and inclusion of outdoor settings, it would appear as if outdoor education is applicable. The significance of outdoor education was made clear more than a half century ago by Donaldson and Donaldson (1958), "Outdoor education has already been termed the major contribution of the 20th century to education" (p.63). The outdoors is used as more than a setting; it is used to provide examples of theory and to engage students to deepen their interest and appreciation of science. "Outdoor education is education 'in', 'about' and 'for' the outdoors" (Donaldson & Donaldson, 1958, p.17). Also, the "outdoors is a thematic and interdisciplinary field of research and education in the natural and cultural landscape arena" (Szcepanski, 2001, p.19). That is, outdoor education is multidisciplinary, occurring in outside settings where skills and attitudes may be applied and contribute to the overall experience of being in that environment (Donaldson & Donaldson, 1958; Priest, 1986). Even from the mid-20th century onwards, Donaldson and Donaldson (1958)

argued that learning about the outdoors solely from the indoors would be an incomplete education.

There are, however, issues with using the term "outdoor education". In particular, it is a term that has been defined in a wide variety of ways over the years and in different places. In Singapore, outdoor education is part of the curriculum and is defined "as providing 'a strong foundation for a lifelong pursuit of a physically active and healthy lifestyle'" (Atencio & Tan, 2016). They further explain that in the Singaporean context, outdoor education emphasizes students' participation with the outdoor environment. While in the Swedish context, outdoor education provides an experiential way of learning abstract concepts (Szcepanski, 2001).

An additional variant definition links outdoor education to place-based education. According to Ebersole and Worster (2007), a sense of place is "having ecological and social knowledge necessary for the development of one's ecological and social identity associated with a place" (p. 19). This is complementary to Gruenewald (2003) who viewed place-based pedagogies as connecting "the social and ecological places people actually inhabit" (p. 3). With respect to outdoor learning, "place" can help further understanding of sustainability, culture, and history at a local level (Christie, 2012). Beames' (2015) approach is to reveal the key assumptions to place-based education that involve: the educator and education; any environment (urban, rural, and others); consideration of the present, future, and past; curriculum-wide applications; interactions between humans and landscapes; "it requires a certain amount of 'dwelling' and 'responding'" (p. 28). For Worster and Abrams (2005), there are a few main characteristics that a person develops as a result of a sense of place: ecological knowledge, social knowledge, and attachment (emotional bond) to community in a place, whether it is human or not. Complementary to sense of place, place-based education narrows the gap between

communities and schools by situating local culture and ecology with curriculum (Ebersole & Worster, 2007). As an example, in a study by Adams, Miller, Saul, and Pegg (2014), place-based pedagogies were used to support preservice elementary STEM (Science, Technology, Engineering, and Mathematics) teachers. In that study, preservice teachers created learning activities to complement the knowledge and relationship between Native American students and their local environment. One of those activities concerned dams and this was especially relevant to the community, that is, there are mixed feelings about the creation of dams since they stop salmon from swimming to their spawning areas. That activity connected local culture with local environment (place), with science. Furthermore, place-based education has been associated with rural, environmental and ecological, and outdoor education and contributes to more positive community life when students are engaged (Atencio & Tan, 2016; Gruenewald, 2003). Using this definition, the emphasis is upon place including cultural and social context, rather than education that occurs in outdoor settings. Within the context of my study, I focused upon the use of outdoor environments with teaching biology rather than emphasizing the socio-cultural-historical context of said environments.

Outdoor education is also sometimes used synonymously with environmental education. For example, Gough (2016) attributed the distance of outdoor education from the theoretical and physical location of schooling as a form of environmental education. Priest (1986) similarly uses the term outdoor education to emphasize the importance of developing relationships with the natural world,

> *outdoor education is an experiential process of learning by doing, which takes place primarily through exposure to the out-of-doors. In outdoor education the emphasis for the subject of learning is placed on RELATIONSHIPS, relationships concerning people and natural resources* (p. 13, original emphasis).

Priest's emphasis appears to be upon the experience and relationship between humans and nature. Yet, he clarifies that his view is a combination of adventure and environmental education so that the focus is upon relationships between humans and the natural environment, ecosystems, inter and intrapersonal relationships.

Outdoor education sometimes enmeshed in wild pedagogy. According to Jickling (2016), wild pedagogies "rests on the premise that an important part of education can include intentional activities that provide a fertile field for personal and purposeful experience without controlling the outcomes" (p. 6) and "wild places as places of engagement" (p. 4). The places he is referring to are in the wilderness.

Another problematic area is that using the term "outdoor education" can also refer to other ways of learning in outdoor environments. As an example, it may include experiential education, which incorporates activities such as rope courses, backpacking, cross-cultural homestays, work-study programs, and other experiences (Chapman, McPhee, & Proudman, 1992). Or, it can also be considered as outdoor and experiential education that includes multi-seasonal outdoor activities and education, and critiquing outdoor programs (Queen's University, 2009; University of Regina, 2016). Sarv and Vilbaste's (2008) definition includes the senses and expands upon learning, "Outdoor education is learning in a genuine environment with all the senses, by doing with one's own hands, sharing with others what was learnt and teaching it further" (p. 10). Sarv and Vilbaste's view echoes that of Donaldson and Donaldson (1958) who espouse "learning by using the senses out where the subject matter exists" (p.17).

The preceding paragraphs have shown the different areas that the term "outdoor education" may be associated with, including lifestyle, place-based education, environmental education, wild pedagogy, and other ways of learning outside. The wide range of activities and views that the term "outdoor education" can be associated with is somewhat confusing and vague.

The purpose of outdoor education is to "complement and expand classroom instruction by providing meaningful contextual experiences in natural and constructed environments" (Woodhouse & Knapp, 2000). This setting easily allows for a multidisciplinary and interdisciplinary approach to teaching (Jordet, 2008). It is important that the use of the outdoors be complementary to the purpose of the lesson since each experience will affect the interpretation of future experiences (Chapman et al., 1992; Dewey, 1938). These views echo Sharp (1943),

> *That which can best be learned inside the classroom should be learned there; and that which can best be learned through direct experience outside the classroom, in contact with native materials and life situations, should there be learned.* This involves, for *outdoor education*, the utilization of the whole environmental area commencing with the school yard and extending outward as far as the students care to walk or the school authorities care to transport them (p. 43, original emphasis).

From the above quote, Sharp emphasizes the outdoors as best matched with the material being learned. His view is complementary within the context of my study where the outdoors is understood to be more than simply being outside, such as a teacher having students read their textbooks in an outdoor setting. Sharp (1943) shares a similar perspective in that there are few pedagogical gains by being out of doors for the sake of it. Instead, its inclusion with biology teaching is potentially more meaningful by expanding and complementing indoor lessons, and influencing students' attitudes for science learning. Within the context of this study, the outdoors is regarded as both concept and setting for learning science that aligns, complements, and expands upon classroom lessons. This subtly differs from teaching biology outside because

a teacher can bring students outside and have them read their biology textbooks and answer questions without any engagement or appreciation for the environment. Instead, by expanding upon indoor teaching, students actively participate and apply their knowledge to outdoor settings as opposed to simply being outside for novelty.

To better describe the way the outdoors is implemented within my study, the term "outdoor biology learning" will be used. Beames, Atencio, and Ross (2009) defined outdoor learning as "all kinds of learning that might take place outside of the classroom or gymnasium." The issue with this definition is that it is not clear whether that kind of learning also applies to traditional indoor laboratories. Glackin's (2013) view is more specific to the pedagogical setting, "'outdoor learning' involves students learning within an open space beyond the constraints of a building, for example, field centres, parks, school grounds" (p. 18), and she uses the term "outdoor science learning" in the stead of "fieldwork" (p. 18). Her view aligns with Christie (2012) who considers any kind of learning outside of the classroom as "outdoor learning." These views mostly align with the way the outdoors is referred to within my study. Yet, a major difference is that there is no specificity to subject discipline. Since my study is specific to the inclusion of outdoor settings with biology teaching, my working definition of "outdoor biology learning" is: any type of student biology learning that expands upon indoor teaching while occurring in natural or urban environments. Thus far, the view presented has been biased in favour of including outdoor settings. The following section provides a more balanced outlook.

2.3 Pedagogical Reasons on Whether to Incorporate Outdoor Learning

      Not all teachers choose to include outdoor settings with their teaching. To further explore that notion, this section looks at the rationale for and against the incorporation of the outdoors.

2.3.1 Pedagogical Reasons in Favour of Incorporating Outdoor Learning

      There are numerous pedagogical reasons in favour of incorporating outdoor learning with teaching. However, the outdoors as a learning setting is often neglected by educators despite its uniqueness as an instructional context (Orion, Hofstein, Tamir, & Giddings, 1997). For instance, physical activity in outside settings may improve motor skills, physical health and coordination (Auwer, 2006; Jordet, 2008). Another reason for including outdoor learning is social skill development. Implementing student-centered activities outdoors provides opportunities for further development of communication, cooperation, decision-making and relationships (Chapman et al., 1992; Jordet, 2008; Lewis & Williams, 1994). To facilitate these types of activities, the teacher is a guide, providing assistance when necessary, but it is up to the students to be fully engaged (Chapman et al., 1992). Students have the chance to develop their self-confidence by being accountable for their decisions. The third rationale is that outdoor learning provides a stronger connection to the world and allows for multidisciplinary and interdisciplinary learning. Outdoor and experiential education is applicable to different subject areas and lends itself to cross curricular learning (Adkins & Simmons, 2003). This type of education can enhance the knowledge base of multiple academic subjects, including science, because it fits into different curricula but, teachers must also help students make connections to other disciplines (Chapman et al., 1992; Foster & Linney, 2007). For example, Ting and Siew's (2014) study

examined the impact of outdoor learning settings upon scientific curiosity and process skills. They found that when students learned outside, test scores indicated that students' process skills such as observation and classification increased, along with curiosity.

Outdoor learning can enhance the classroom science experience of students if it is "properly conceived, adequately planned, well taught and effectively followed up" (Dillon et al., 2006, p.107). The outdoors may be used as a learning environment for authentic activities to further develop practical knowledge and creativity (Szcepanski, 2001). In contrast, traditional indoor classrooms may be superficial and that causes knowledge to be temporary rather than ingrained. According to Glackin (2013), when science education occurs in outdoor settings, there are other learning opportunities available than those within the classroom. She also adds that students can develop scientific connections to a location that extend beyond traditional indoor laboratory activities if more lessons occurred outdoors. However, she also points out that only some science teachers are willing and able to incorporate outdoor settings and that this may be related to confidence, teacher efficacy, or beliefs. From Christie's (2012) review of outdoor learning literature with respect to attitudes towards sustainability, she listed numerous opportunities provided through outdoor learning, most notably: a setting for students to become more amenable towards sustainability; where students can become engaged and critically examine environmental issues; a setting where students can see the consequences of their actions so they may begin to understand their influence upon the landscape, environmental issues, and local setting. Her findings align with Carrier, Tugurian, and Thomson (2013) who described exposure to outdoor settings affecting attitudes and awareness towards the environment, confidence in outdoor settings, and motivation towards and skills in science learning.

Furthermore, including the outdoors with science subjects, such as biology, is important because: students may have the chance to immerse themselves in unique environments; teachers may potentially further their relationships with students in positive and productive ways; the environment is a setting where science can be integrated, multidisciplinary, and a foundation for scientific enquiry; the outdoors may connect theory with societal issues; experiences in the natural outdoors may affect students' attitudes towards sustainability; and limiting students to indoor laboratory activities does not provide the full context of biology and diminishes the importance of outdoor experiences (Barker, Slingsby, & Tilling, 2002; Carrier, 2009; Chantrell, 2015; Ting & Siew, 2014). Those sentiments are echoed by Aydin (2015) who feels that outdoor settings provide other opportunities for learning elementary science. Additionally, Szcepanski (2001) emphasizes the multisensory experiences, development of social skills, and furthering of creativity that the outdoors provides rather than indoor classrooms.

There are different ways that a teacher may be encouraged to incorporate outdoor settings. For example, Feille (2013) found that forms of support such as mentoring and role modeling from colleagues, and experiences with outdoor learning with their students helped teachers to include outside learning environments with their classes. From a teacher education perspective, Carrier's (2009) findings indicate that preservice teachers' attitudes towards outdoor science lessons were positive after participating in field experiences with elementary school students. Because the preservice teachers felt that they contributed towards the students' enthusiasm for learning science, this experience provided a foundation for them to develop confidence about their teaching and to continue to include the outdoors with their future classes. Similarly, Trauth-Nare (2015) also found that the experience of working with K-12 students was strongly influential in preservice teachers' self-perception of being a successful educator. In addition,

Mensah's (2011) findings indicate that support, personal empowerment, collaboration, and personal relevance of the subject contribute towards preservice teachers adopting future practices. Another influential factor included learning in local outdoor settings. Quantitatively, a scale instrument was developed to measure the effectiveness of field trips and it was found that the greater the interaction the students had with the environment, the greater the effectiveness of the field trip (Orion et al., 1997). Those results may encourage teachers to be more aware of students' interactions with the environment when planning outdoor activities.

Glackin (2013) has noted the importance of factors beyond simple training in the outdoors that influence whether teachers take advantage of these opportunities. She notes that identity and prior experiences strongly influence these decisions. For example, a teacher who chooses to include outdoor settings with their teaching may value learning opportunities that differ from those restricted to indoor learning environments. An outdoor environment may provide other ways of further developing multidisciplinary and interdisciplinary learning social skill development (including influencing attitudes and awareness of the environment), and physical skills. In terms of science education, learning settings outside of the classroom may help students deepen their understanding and connection to that location. Furthermore, she considers outdoor settings as opportunities for different ways of learning science.

2.3.2 Pedagogical Reasons Not in Favour of Incorporating Outdoor Learning

Despite these reasons in favour of incorporating outdoor learning, there are teachers who do not integrate the outdoors into their teaching. The specifics of how and why teachers make these pedagogical decisions is not fully understood (Glackin, 2016). Even if the science focus is upon the natural world, science education mostly occurs in an indoor classroom without

experiences in outdoor settings (Carrier et al., 2013). Some explanations provided by those

researchers include the lack of time needed for planning and conducting activities, lack of

confidence when including the outdoors, not valuing outdoor landscapes for student learning,

and other reasons. Moreover, they describe the potential of the solely indoor science education

can have for fostering a fear of the outdoors in the students, such as fear of wild places, outdoor

hazards, concerns about dangerous plants and wildlife, and in addition, fostering a fear of

litigation in the teachers, which could result from an accident with a student in an outdoor setting.

This is a travesty because it means that there is a decline in the number of students who have the

opportunity for outdoor experiences with science and who can benefit from the aforementioned

advantages as identified by Barker, et al (2002). For these researchers, it also means that with

fewer teachers who integrate the outdoors, there are fewer role models for beginning teachers

demonstrating how to use these settings and with limited experiences, they may not incorporate

activities outside the classroom, resulting in a repetitive cycle. Barker et al. (2002) found that

some of the causes for fewer teachers using the outdoors are: the lack of trainee science teachers

who have experience with fieldwork, the decline of science advisors, publicized incidents of

death and injury during outdoor activities, and fieldwork not being valued as much as other areas

of biology (such as genomics). The cyclic decline of integrating the outdoors with science is a

serious problem that could adversely affect students' academics and non-academics, and

teachers' relationships with students. This study hopes to contribute towards ending that cycle

by focusing on those teachers who choose to use the outdoors and helping to better understand

how teachers could be supported in prioritizing more outdoor practice.

In understanding the constraints teachers face, there are also issues of professional development and time concerns. From a professional development perspective, teachers may not have the knowledge or experience of incorporating outdoor education. For example, if a school had purchased some type of resource kit that involved lessons designed for the outdoors, without the necessary knowledge for implementing these lessons, the teachers may not be able to use the kit according to the developers' intentions (van Driel, Beijaard, & Verloop, 2001). Those sentiments are echoed by Feille (2013) who also included funding, curricular links, and lack of support from the entire school as additional challenges to incorporating outdoor settings.

Furthermore, encouragement may be needed for these teachers to pursue the professional development necessary for incorporating outdoor settings (Sharp, 1943). With respect to experience, if a teacher has not incorporated outdoor education before, s/he may not choose to incorporate it even when given the opportunity (Dillon et al., 2006). Another teacher issue discussed by Dillon et al. (2006) is time, since it may be one of a few limitations including lack of resources, and lack of support to incorporate outdoor education. They also add that when organizing a lesson outdoors, extra time is spent preparing the students to leave and return to class in an orderly fashion, travel time to the outdoor site is needed, and planning the lesson also requires extra time. In addition, Dillon et al. (2006) add that teachers must also account for the health and safety of students while outdoors, i.e. to bring first aid kits, to make sure any outdoor allergies are known, and other concerns. Without experience, teachers may lack confidence in teaching outdoors, especially if they did not learn how to use that learning setting (Carrier, 2009; Dillon et al., 2006; Orion et al., 1997). For instance, it has been found that in Norway, training in outdoor schooling is not part of science teacher programs and this may contribute to some teachers not incorporating the outdoors (Jordet, 2008). Moreover, some teachers may lack

confidence without supporting literature to include the outdoors (Mirka, 1973). While these constraints have been noted by several researchers, at this time, research is still limited about reasons that teachers might, on the other hand, choose and become committed to the incorporation of outdoor schooling to enhance science curricula (Glackin, 2013; Jordet, 2008).

In addition to the issues faced directly by teachers, teachers who incorporate the outdoors may also perceive barriers faced by students in regard to their participation in outdoor activities. There are three important areas of student issues. The first area of concern is that students may be apprehensive if they are not used to going outside and/or do not have prior knowledge and experience with academic outdoor activities (Dillon et al., 2006). These authors go on to add the second concern, which is that some students may have fears and phobias about outdoor settings, such as natural hazards, wild animals and other worries that may cause some students to be resistant towards going outside. Moreover, the third area is that some students may have physical challenges or special educational needs that would make the outdoors a difficult learning environment.

These hindrances may have certain ramifications for teachers incorporating outdoor settings into their practice. For instance, a teacher who only chooses indoor environments may be uncomfortable with outdoor learning settings (due to unfamiliarity with this type of teaching) or may choose to maximize the amount of time availability in a course, or may want their students to be as comfortable as possible. In general, a teacher who is hesitant may also not see the value of the outdoors from a pedagogical perspective. Rather than focussing upon the barriers, however, my study seeks to understand why many teachers persist, why they continue to pursue outdoor experiences for their students despite barriers they may face.

2.4 Using Outdoor Learning in K-12 Teaching

Although the inclusion of outdoor settings is not universal, there are teachers who choose to use those environments. For example, Welz, Laurenti, McMillan, Morden, and Van Buskirk (2016) described a group of kindergarten teachers who use a small wooded area for various activities. Their use of the outdoors was to build upon children's play and ideas through observation and facilitation. In turn, this led to higher cooperation, creativity, and independence in children's play. Whether their play contributed towards their science learning is unknown since their paper did not specify applications of learning towards subject disciplines.

However, Sobel's (2004) book "Place-Based Education" provides examples of outdoor learning in science for various grade levels. For instance, he cites a study conducted by researcher Carole Basile at an elementary school in Texas where a class of third graders was split between traditional (indoor learning through environmental activities, art projects and worksheets), and outdoor learning (creating their own research investigations and questions to solve) for science. It was found that both groups of students could transfer their knowledge to similar situations but only the outdoor group was able to apply their knowledge to very different contexts. This demonstrated one example of how learning in outdoor environments could contribute towards developing scientific skills such as problem solving, observation, and analysis.

Another example from Sobel (2004) were the seventh graders at a middle school in Maryland who constructed rain gardens on school property. These gardens collected rainwater runoff while providing a habitat for local flora and fauna. Their project demonstrated the benefits of helping the local environment and developing a closer relationship with the school.

A final example from Sobel (2004) was a group of secondary students in Maryland who engaged in restoration projects. The Department of Natural Resources and Chesapeake Bay Foundation worked together to emphasize the importance of grasses in that area. Then, the students grow those grasses and then transplant them back to their natural habitat where the grasses were previously diminishing. This activity helped to develop students' attitudes towards stewardship.

Aydin's (2015) approach was slightly different, combining outdoor activities with computer-aided concept cartoons to teach seventh grade students in Turkey about light pollution. Findings indicated that these methods contributed towards students' increased understanding as reflected in their test results. In addition, students were enthusiastic towards these teaching methods, as shown from interviews after learning about light pollution.

Collectively, these examples demonstrate that there are K-12 teachers around the world who include outdoor learning environments with their teaching. Yet, the deeper exploration of the reasons behind why these teachers incorporated the outdoors, despite the barriers they may face, is missing.

2.5 The Relationship Between Science Education and Nature

Before delving into why some teachers may incorporate outdoor environments with their teaching, a discussion on the relationship between science education and nature is needed.

To begin a meaning of science must be considered. While there is no single universal definition of what science is, a common view is that it "is a naturalistic, material explanatory system used to account for natural phenomenon that ideally must be objectively and empirically testable" (Cobern & Loving, 2001, p.60-61). In terms of nature, according to Hoeg (2016) "truth

claims made by science can be criticized as simply human interpretations of nature" (p.33). However, those notions pertain to general science. In terms of biology as a subject discipline, it can be referred to as "a science of life" or "a science of living" (Roberts, 1998, p.5). Even in more specific science areas, multiple views exist. This study focuses upon the pedagogical view.

Pedagogically, a science education perspective of nature follows. According to Roberts (1998), science is the "correct" view of the world. That view may be established from ideals during the European enlightenment where humans were viewed as having dominion over and differing from nature (Hoeg, 2016). During the seventeenth century was a scientific revolution where there were three approaches: objectified (humans and nature differ from one another); atomistic (smaller components can explain the actions of the whole); and, mechanistic (a mechanism may account for the phenomena in question) (Östman, 1994, 1998). Since that time, Hoeg (2016) describes science as using models to understand nature's complexity. To extend that notion further to school science, he describes that nature may be an object of scientific investigation. In sum it appears that science education views science and nature as separate from one another.

The dichotomy between science and nature is echoed in the relationship between them. For example, Östman (1998) explains a couple of educational views of nature such as a tool to help students understand scientific concepts. Another view from him is that science may be used to interpret the human relationship to nature. In addition, communication from teachers and texts may portray a value or moral responsibility to the human-nature relationship (Hoeg, 2016). Using school science textbooks as an example, environmental issues are treated as separate from science since its usual placement is a separate chapter rather than integrated with other science

content (Östman, 1994). However, that same researcher contends that science teaching cannot be separate from environmental social issues.

To analyze the way science is taught, Östman (1994) describes two frameworks: the way we should treat nature, and the way we should conceptualize our relationship with nature. Those frameworks complement findings from Hoeg's (2016) doctoral research. A couple of his findings are that praxis in school science illustrates nature as separate from the student so that it is reduced to an algorithm, or object, or model, or machine. Also, the way that praxis generates knowledge about nature is through domination and control of nature. Overall, the relationship between science and nature seems to indicate that they are individual identities rather than being joined together.

The separateness between humans and nature may be partially attributed to past events. Hoeg (2016) describes a few historical instances that could have contributed to that separateness. For instance, the start of agriculture seems to have started the loss of humans living harmoniously with the environment. Or, the Christian story of creation emphasized the distinction between humans and nature and its implication is that the natural world is meant for human use. The final example is that the subject of taxonomy emphasizes the distinction between humans and nature. That is, the human relationship with nature is based upon our perception and use of said relationship (Hoeg, 2016). As an illustration of that perception, "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold, 1949/1989, p.218-225). Östman (1998) supports that view through the lens of stewardship as a responsibility for all humans, and through the lens of the intrinsic value of nature that humans must respect. A complementary support is that positive experiences in nature assisted in environmentalists choosing their career path (Simms,

2017). However, there are other perceptions of nature. For instance, the divide in the subjects of

natural science and humanities represent the separation between studying nature and studying

human concerns, respectively (Hoeg, 2016). A different example is the lack of moral obligations

humans show toward nature through viewing nature as an instrument, and viewing humans as a

detriment to the natural world (Östman, 1998).

In sum, the relationship between science education and nature is under tension. In

general, our attempts to understand nature have only served to widen the gap between it and

science. This is further compounded through the teaching of science including textbooks and

teacher praxis since they both emphasize the differences between humans and the natural world.

However, if we view nature with the perspective that it cannot be separated from science and/or

value nature in a way where we do not violate it, then there is hope of being in harmony with it.

Whether biology teachers view nature as separate or in harmony with science will be discussed

further in Chapter 8.

2.6 Similar Pedagogical Approaches to My Study

There are some studies where use of the outdoors is similar to the way my participants used

that setting. For instance, Dowd's (2009) doctoral work examined the effect of outdoor science

educators' identities upon their pedagogical decisions. The context of his research took place at

several outdoor science education centers, half of which are located in the United Kingdom and

the other half are located in the United States. Although my participants went to different types

of outdoor locations, such as a biological research station (Shiera), museum (Hal), or school

grounds (Zatanna), the similarities they share with Dowd's study is that all outdoor activities

were connected to curriculum, students actively participated within these settings for learning science, and it is hoped that students gained an appreciation for the outdoor environments. Other than using specific outdoor centers for using the outdoors, Glackin's (2013) doctoral study used a professional development programme to influence teachers' beliefs of pedagogy and practice so they may be more amenable towards incorporating outdoor settings. One of her key results is that continued use of outdoor activities led to increasingly positive teaching experiences. This aligns with Carrier et al. (2013) who described teachers' beliefs as being significantly influential on their pedagogical decisions including instruction and practice. While the teachers in my study utilized the outdoors without the influence of a professional development programme, there is a resonance between Glackin's (2013) finding and my study. As an example, my participants discussed that the outdoor experiences they found to be effective and enjoyable for their students motivated them to continue to use outdoor settings for learning science. Yet, further details of why teachers would choose to include natural settings with their practice is needed.

2.7 Summary: Outdoor Education

Because this study involves outdoor settings in a specific way, it was necessary to narrow the working term to "outdoor biology learning". For example, within this study, outdoors is both concept and setting simultaneously. In this study, outdoor biology learning will be taken to mean students' biology learning occurring in natural or urban outdoor settings that complement indoor teaching. There are pedagogical reasons for including and not including outside environments with teaching. In general, the rationale in favour of including those environments is student development (ex. physical health, social skills, different types of learning, enhancing

their science learning experience, immersing themselves in unique environments, and others).

To support teachers for including the outdoors, professional development (ex. role modeling,

mentoring, experience with outdoor activities, etc.), preservice education, and results from

quantitative instruments, may motivate and encourage teachers in that endeavor. Educators who

choose not to incorporate outside learning environments may not have any outdoor activity

experience, knowledge teaching in such settings, and time concerns. Rather than focusing on the

challenges and hindrances towards incorporating the outdoors, this study focuses upon why

teachers choose to include outside settings.

Some previous research has a similar pedagogical approach to my study. Namely,

Dowd's (2009) doctoral dissertation delved into the effects of identity upon pedagogical

decisions for outdoor science educators. Another similar study was from Glackin (2013) who

used a professional development programme to influence teachers' beliefs of practice and

pedagogy of including outside learning environments. Although similar, my study is somewhat

different as I explore why teachers choose to use the outdoors rather than the effects of identity

on decision making or professional development upon their practice. Hence, if identity is

considered as a framework for guiding teachers' decisions and practice, it may be a fruitful way

of exploring why they include the outdoors with their biology teaching.

2.8 Science Teacher Identity

Prior to discussing the relationship between science teacher identity and their practice, it

is essential to first examine science teacher identity. Using the seminal review by Avraamidou

(2014b) "Studying science teacher identity: Current insights and future research directions," her

work is used as a foundation to discuss more recent literature. She reviewed 29 empirical studies

26

published between 2001-2013 in leading journals. The remainder of this section follows the same procedure for work published from 2014 onwards.

Although research on teacher identity is vast, literature concerning science teacher identity is more limited. One common finding between these two areas is that neither espouses a universally accepted definition for teacher identity or for science teacher identity. (The lack of an accepted definition for teacher identity is further discussed in the following chapter.) Yet, Avraamidou's (2014c) definition for science teacher identity is, "ways in which a teacher represents herself through her views, orientations, attitudes, content knowledge, knowledge, and beliefs about science teaching, and the ways in which she acts within specific contexts" (p.224, original emphasis).

Avraamidou's (2014b) review is seminal because she offers a comprehensive summary of empirical studies about science teacher identity since 2001 to 2013. Overall, her review shows two broad categories for published science teacher identity research: a frame for science teacher identity or a support for the development of science teacher identity. For each category, she created sub-categories to further specify findings. For example, the different frameworks found for studying teacher identity included: identity as a lens for studying science learning; identity as a lens for teacher preparation; teacher identity; reform-minded teacher identity; subject matter knowledge and teacher identity; competence, performance and recognition as dimensions of identity; life histories and context influencing teacher identity; and a post-structured stance to studying teacher identity. And forms of support for teacher identity development were described as: participation in field-based courses; informal science experiences; the use of technology applications; the role of professional development; the use of curriculum materials; and personal histories and biographies.

Furthering our understanding of teacher identity is important for a variety of reasons. One possible reason is that identity is considered as the starting point for teachers' decision making and meaning making (Avraamidou, 2014b). Another significant reason for studying identity according to Avraamidou (2014b) is that identity considers context and sociocultural nature. By using identity as a framework, it can further examine teachers' decision and practice since it considers more than skills, knowledge (Avraamidou, 2014a), decision making, or the influence of professional development.

Using the same search method for literature, there are limited updates to Avraamidou's (2014b) seminal review. For instance, the only new empirical study found that can be categorized as "identity as a lens for teacher preparation" (Avraamidou, 2014b) is a study by Mensah and Fleshman (2017). From their work, those researchers sought to understand preservice elementary science teachers' self-perception of the characteristics of an ideal science teacher through drawing. Those preservice teachers were asked to draw an ideal elementary science teacher at the start and end of a science methods course. The drawings indicate the overall personal view with which the preservice teachers consider science, whether it be a negative or a positive view. In the case of a negative view, there is a concern that that teacher's perception may manifest itself into their future practice and inadvertently cause students to have less regard for learning science. However, by the end of the course, some of those preservice teachers changed their self-view to be more positive of the way they saw themselves as science educators. Their study is significant because it shows that identity is malleable, ex. preservice teachers can develop a more positive view towards science. That may mean their future practice will also be more favorable towards science so that students' will develop a similar attitude.

The remaining updates are related to the Avraamidou's (2014b) second category of empirical studies – a support for the development of science teacher identity. For example, the remaining two updated studies can be sub-categorized as "personal histories and biographies" (based on the sub-categories Avraamidou (2014b) used in her review). The first study is a qualitative case study by Avraamidou (2014c) where field experience, first year of university, and first year of teaching are cumulatively considered as the foundation for the development of an elementary science teacher's identity. Her study was important because it demonstrates that experiences throughout someone's life may effect their science teacher identity development, and it emphasizes personal context and multidimensionality as a factor in shaping identity. Similarly, Rivera Maulucci's (2013) is also a qualitative study that focused upon one preservice teacher's autobiography and narrative, such as exploring her reasons for choosing to be a Chemistry major then choosing to be a Chemistry teacher, and her challenges towards multicultural education as an African-American Caribbean woman and social justice, to more closely examine her development as a Chemistry teacher. While Avraamidou's (2014c) findings emphasized context at personal and sociocultural levels, Rivera Maulucci (2013) focused upon emotions and autobiography. Her results appear to recognize the need to use autobiography and emotions as a way of illuminating any hindrances or misgivings preservice teachers may have towards their pedagogical belief systems so that teacher educators can better respond to their needs and provide forms of support geared towards their emotional well-being.

Updating Avraamidou's (2014b) seminal review shows that three years on, empirical studies about science teacher identity are still broadly limited to the way science teacher is framed, and forms of support toward science teacher identity development. An area not emphasized is the relationship between science teacher identity and its relationship to science

teacher practice. To further explore why science teachers would choose to incorporate outdoor settings with their teaching, an examination of their identity as it relates to their practice is needed.

2.9 Influences on Teachers' Pedagogical Practices

In the previous section, the lack of universal implementation of outdoor learning settings was presented. However, there are of course many teachers who do choose to include outdoor environments with their practice, such as those highlighted by Sobel (2004). To explore how and why teachers make that choice, related studies looking at similar pedagogical decisions will be analyzed to shed light on this issue. Furthering understanding of how and why teachers make the pedagogical decisions that they do is fundamental towards exploring the adoption of certain teaching orientations over others, such as the inclusion of outdoor settings with biology teaching.

With regard to my study, it is possible that the science teachers who incorporate outdoor settings are those who have the knowledge to use learning environments that extend beyond the classroom and/or school building. This line of thinking is consistent with Sharp (1943), who felt that professional and pre-service teachers should have some kind of development for implementing outside environments. For example, in a study by Barnett and Hodson (2001), their key finding is that the complexity and subtlety of teaching requires different kinds of knowledge, such as academic and research knowledge, pedagogical content knowledge, professional knowledge, and classroom knowledge. Moreover, their findings show that "good science teachers" (p. 448) use these different forms of knowledge to guide their instructional strategies. It may, on the surface, seem like increased knowledge about outdoor teaching might be an important factor.

It is clear in the literature that teacher knowledge is not sufficient to capture the subtle decisions that teachers make in their everyday practice. As an example, findings from Wallace and Kang's (2004) study show that teacher beliefs impact their practice with respect to inquiry teaching. Within the context of their study, beliefs "serve as the filter through which practical knowledge is developed" (p.938). For instance, teachers whose beliefs centered upon exam preparation, efficiency, rigor, and student knowledge, limited their decision to implement inquiry instructional methods. Yet they found a contradiction in that teachers' core beliefs supported using inquiry teaching and they did use that form of teaching, albeit in limited ways. Wallace and Kang's study demonstrates that specific beliefs, such as correlating science learning with understanding scientific concepts, or enculturation into scientific practices, seem to impact specific areas of teaching, such as decisions to engage inquiry science teaching.

Similarly, Glackin's (2016) study examined a professional development programme over two years that was designed to enhance the pedagogy of secondary science teachers and to co-create ten outdoor science activities that they would conduct with their classes. Her results indicate that science teachers aligned their social constructivist or traditional beliefs with their practice. Teachers with the former beliefs emphasized student knowledge and application of their skills and learning and felt that these could be fulfilled in outdoor settings. Those teachers who identified with the latter beliefs focused upon students becoming future scientists and viewed the outdoors as a novelty and more appropriate for knowledge transfer instead of a setting to develop new understandings. The significance of Glackin's (2016) findings is that she correlated science teacher beliefs with incorporating outdoor environments as a stronger influence than context, such as the school grounds, or teachers' professional characteristics, such as their subject specialty or number of years taught. In addition, she grouped specific beliefs

with specific practices, such as teachers with social constructivist beliefs had a practice where students were to apply their skills and learn knowledge, or those with traditional beliefs taught in a way where they wanted their students to become future scientists and to have scientific knowledge, and other relations. As significant as her findings her, it is limited by the professional development programme that her participants were members of. Without that professional development programme, what would be teachers' rationale(s) for incorporating the outdoors? Identity may be one way of trying to answer that question.

Using identity instead of beliefs as a construct may provide a larger picture of practice. Consider the critique presented by Luehmann (2007), who posited that if beliefs are limited to the way a person thinks, then this is too distant from teaching practice to be applicable towards professional development of teachers. However, according to that researcher, if identity is used as a lens to view teacher practice, then that view includes behavior, philosophy, and the way someone's experiences influence their practice, values, and commitments – in addition to their beliefs. Other researchers also support the notion that an identity lens to view teaching practice includes and extrapolates past beliefs. For example, for Gee (2011a), identity is tempered by time, place, and purpose, all bounded by a sociocultural context where we recognize a person or people as acting in a particular way. That sentiment is shared by Coldron and Smith (1999) who regard identity as socially bound and legitimated, and that recognition is needed to "see" an identity. Together, these researchers show that using identity as a construct to view practice is a more detailed picture than only using beliefs. That construct includes and extends beyond beliefs to incorporate personal influences such as beliefs, philosophy, experiences, and context such as the socio-cultural-historical setting.

Additionally, identity includes a sense of self that involves reflection and recognition so that a teacher may determine whether s/he can enact any educational decision needed. In other words, the kind of person who has beliefs is different from the beliefs themselves. Moreover, by being recognized as a certain kind of teacher, identity may help analyze the engagement and participation of a teacher's practice (Luehmann, 2007). Identity has therefore been chosen as the central explanatory construct for this study into teachers' outdoor teaching practice. To further examine the relation between identity and practice, a couple of studies will be discussed in the next section.

2.9.1 Identities and Practice

A closer examination of experienced teachers' identities in relation to their practice provides a view of the way that identities may be integral to teaching approaches. In a study by Goodnough (2011), teacher identity was affected by participation in action research and in turn, their classroom practice was also affected. Within her study, teachers participated in a collaborative action research project where teams of teachers from the same school chose a particular aspect of their teaching and learning which could be improved through classroom interventions. Findings of that study indicated that teacher identity changed so that most of the teachers gained confidence in their science teaching and realized the importance of learner-centered environments for students. Moreover, teachers also described changes to their practice such as using more reflection and inquiry-oriented methods. This research demonstrates that changes to teacher identity also result in changes to teaching practice. Goodnough's (2011) study contributes to furthering understanding of the impact of action research on teacher identity and practice. Her method differs from my study since I do not use action research. Instead, I use

identity as the framework to understand why some biology teachers integrate the outdoors with their practice.

Dowd's (2009) doctoral work explored the way that the identity of outdoor science educators affects their teaching decisions. By categorizing the participants' identities across three dominant teaching identity types, his results demonstrate one way of exploring teacher identity both as a collective, and simultaneously, as an individual, i.e. by aligning a category to an individual teacher. This is significant because it shows a connection between groups of teachers and their practice, which may have implications for professional development. In addition, Dowd linked the different identity types with distinct forms of practice. For example, three identity types and their associated teaching practices are: free choice facilitator – teaching involves hands-on activities, is student-centred, and students should have novel experiences; didactic disseminator – teaching should fulfill national and state standards, emphasis upon content knowledge; and pragmatic incorporator – teaching is both curriculum and student-centered, it involves experiential learning and sensory examples where the teacher is more like a guide to learning. The importance of this connection is that it highlights the variety of identity and corresponding practices within the same discipline. Overall, his results demonstrate that there is a connection between outdoor science educator identity and practice and even within the same teaching subject, there are different identities that align with different instructional strategies. However, his study focused specifically on teachers working within an outdoor education setting. For all students to have access to the benefits of outdoor teaching, it is also important to ask these questions in regard to teachers outside of dedicated outdoor settings. It is important to also ask about teachers working within typical public school settings, who have not

chosen a career in outdoor teaching. This study seeks to understand why some of those teachers also choose to make the outdoors an essential element of their classroom practice.

2.10 Summary

This chapter further discussed the literature surrounding outdoor learning and science teacher identity to provide a basis for deeper exploration into the incorporation of outdoor learning settings with biology teaching. The first half of this chapter looked at outdoor learning, pedagogical reasons on whether to incorporate outdoor learning, using outdoor learning in K-12 teaching, and similar pedagogical approaches to my study. That discussion was necessary to contextualize outdoor learning within my study in terms of its definition, why teachers would include the outdoors and the ways it is included so that there is a foundation to continue to develop.

The latter half of the chapter examined science teacher identity, influences on teachers' pedagogical practices, and identity and practice. This dialogue was necessary as a foundation for establishing the relationship between science teacher identity and practice so that their incorporation of outdoor learning environments can be better understood.

The following chapter discusses the theoretical framework for identity.

Chapter 3

Theoretical Framework

3.1 Introduction

In this study, identity is used as a tool to understand and analyze teacher practice, specifically, the way that it may address why some biology teachers incorporate outdoor experiences with their teaching. Applying identity in this manner aligns with Gee's (2001) view from his seminal paper, "Identity as an analytic lens for research in education" where he argues that emphasizing enactment and recognition of identity provides more detailed information than "race, class, and gender" or other predictive factors (p. 99). Prior to using this lens, identity must be described. In this research investigation, identity is illustrated through discourse analysis, particularly analysis of interview transcripts of biology teachers who include the outdoors in their teaching curriculum. Although this relationship sounds linear, it needs to be noted that the relationship between identity and discourse is mutual since they co-construct one another (this relationship is further discussed later in this chapter). Both will be important for how this study is framed and conducted.

This chapter outlines the foundational theory for exploring the connection between the identities of biology teachers and their inclusion of outdoor settings. The emphasis is upon identity in terms of its history and relation to sociocultural context, discourse, and activity (or practice). The remainder of the chapter discusses figured worlds, Discourse, and the type of discourse used within this study.

3.2 Historical Perspectives of Identity

Within this research investigation, a postmodern view of identity is taken. Prior to discussing postmodern identity, it is necessary to first describe the shifting view of identity starting with premodern times.

According to Gee (2001), premodern identity was akin to the way roles and positions were determined during the medieval ages. For example, the church and state, who upheld the laws and traditions, made the decisions of who could have which position in society, such as a monk or peasant or lord, or others. That is, identity was authorized by a governing body that a person had to accept.

In contrast to accepting a given identity during the medieval ages, modern identity is autonomous, such that individuals can author their own identity, and this originated during the Renaissance (Gee, 2001). However, Gee (2001) highlights the dilemma that when authoring your own identity, you still want to be recognized in the way you authored it. That is, the state or church is no longer the authority for you to be recognized in a particular manner. To gain recognition, this must be accomplished through discourse with an audience, such as friends, family, and/or groups you belong with (Gee, 2001; Taylor, 1994). It needs to be cautioned that while sometimes the attempt to gain recognition will fail, there are ways to increase the likelihood of gaining said recognition (Gee, 2001). For instance, elites in society who have more time and resources will be better able to author themselves as being socially and politically above others, e.g. the nonelites. Within modern society, the elites and nonelites need each other for recognition by contrasting themselves to one another. As an example, elites confirm their status by seeing that they have more than nonelites, while nonelites must either accept or oppose or change their status by comparing their position against elites. While modern identity can be self-authored, there is a disparity in the way that can be achieved and recognized.

Postmodern identity has a different approach that is applicable to my study. Instead of focusing upon the self as the sole author of identity while constrained by time and resources, postmodern identity acknowledges the effects of outside influences, while also addressing the problematics of discourse recognition (Gee, 2001). For instance, the fast pace of scientific and technological change means that some identities are outdated while new ones may have opportunities to be created. Also, traditional and nation-state ideas of citizenship become obsolete through globalization (Dowd, 2009; Gee, 2001). With globalization comes greater diversity and this means that people may choose to identify with others outside of their locality so that local traditions start to diminish, and the nation-state no longer has a cohesive identity among citizens (Dowd, 2009). In addition, globalization depersonalizes our everyday experiences by affirming that global events out of our control affect our everyday lives, such as the variations in the price of wheat. In sum, globalization contests modern identity's recognition through discourse. The corollary is that recognition now shifts to affinity membership – the groups of which you are a member (Gee, 2001). On a broader scale, this may be considered as social identity theory that is dependent upon group membership (Simms, 2017).

For this study, a postmodern view of identity is most applicable. When considering the relationship between teacher identity and their practice, it seems likely that outside factors influenced teachers' identity to guide their pedagogical decisions of including outdoor settings. These factors may be discourse, sociocultural context, and activity.

3.3 Identity, Sociocultural Context, Discourse, Activity (or Practice)

Because this study involves identity, discourse, and teaching, it inherently has a sociocultural perspective. For instance, identity, sociocultural context, discourse, and practice or activity, all mutually and simultaneously inform and co-construct one another.

There are one-on-one and three-way relationships: discourse-identity; identity-sociocultural context; practice or activity-sociocultural context; discourse-practice or activity; discourse-sociocultural context; identity-practice or activity; discourse-identity-sociocultural context; discourse-identity-practice or activity; identity-sociocultural context-practice or activity; discourse-practice or activity-sociocultural context, respectively. There is also one overall relationship connecting all the interrelationships as one system that is referred to as "figured worlds" (discussed later in this chapter). The following will explain the relationships in further detail.

3.3.1 Identity

While there are different types of identity, such as evidence of who you are in the form of a driver's license or passport or other government-issued documents, or your own understanding of who you are, there are also multiple definitions of identity. (Sometimes, the search for a definition may be elusive. In terms of science teacher identity, Avraamidou's (2014b) review of empirical studies from 2001-2013 on that topic did not find a unified definition.) Defining identity is intimately connected with context and recognition. Context refers to what Hacking (1986) describes as "a certain time, in a certain place, in a certain social setting" (p. 232).

Consider pre-service teachers as one example of multiple definitions of identity. While at the university and attending their education courses, they are recognized as university students pursuing an education degree to become future teachers. However, when they are in the field and teaching, they are recognized as pre-service teachers as opposed to students. If you were completely unfamiliar with the way education programs and field teaching experiences are structured, it may be somewhat confusing to see the same group of people as students in one setting and teachers in another setting. In other words, an interpretive system is needed to recognize someone as behaving as one or multiple "kinds of person" in a particular context (Gee, 2001). Recognition is based on the communication of emotions, behaviour, tools, objects, and other symbols so that that person and others may recognize her/him as a kind of person doing a kind of thing (Gee & Crawford, 1998). Recognition is tied so closely with identity that it is included with definitions of identity such as Lave and Wenger's (1991), "the way a person understands and views himself, and is viewed by others, a perception of self which is fairly constant" (p. 81). This resonates with Holland, Lachicotte Jr., Skinner, and Cain (1998) whose definition is a self-understanding where someone tells themselves and other people who they are and additionally tries to act that way, especially if that self-understanding is connected with emotions. While these definitions strongly emphasize recognition, context is not directly stated although it is part of their perspective of identity. Gee's (2011a) view directly addresses context and includes purpose, "different ways of being in the world at different times and places for different purposes" (p. 3). It is Gee's definition of identity that will be used in this study since the participants describe their teaching at a particular time and place for a specific purpose (this is described further in the following chapter).

While context and recognition are closely linked with the definition of identity, identity is also simultaneously co-constructed with socioculture, practice and activity, and discourse. The relationship between identity and socioculture will first be examined after describing socioculture and then the other relationships will be explained later in this chapter.

3.3.2 Sociocultural Context

In my study, the sociocultural context is implied rather than directly examined. Before going further, it is important to acknowledge that sociocultural theory tends to be traced back to Vygotsky (Daniels, Cole, & Wertsch, 2007; Holland & Lachicotte, Jr, 2007; Lave & Wenger, 1991). It is a broad theoretical framework where learning is a mediated process (Daniels et al. 2007). Because my study involves discourse and science learning, an application of sociocultural theory to science education is needed. Lemke (2001) addresses that application by the following statement, "In the sociocultural view, what matters to learning and doing science is primarily the socially learned cultural traditions of what kinds of discourses and representations are useful and how to use them" (p. 298). Lemke's view is complementary to my study because I am examining the way that individual teachers' discourse may illuminate aspects of their identity that affect them in making decisions about their teaching practice, such as including the outdoors. The consideration of socially learned cultural traditions in science education and associated discourses is inherent to my study because they are ingrained within the discourse of the participants. In other words, the influence of the science background and education of the participating teachers would innately be a part of the way that they talk about their pedagogy and practice.

3.3.3 Discourse

Prior to describing the relationship between discourse and identity, discourse will first be addressed. In my study, discourse refers to language but is different from national languages like French, Farsi, Amharic, and others. Rather, it is close to Davies and Harré's (1990) definition, that "a discourse is to be understood as an institutionalized use of language and language-like sign systems…a multi-faceted public process through which meanings are progressively and dynamically achieved" (p. 45-46). Because those researchers consider discourse as partially creating meaning, they relate discourse as one way of knowing a particular topic. As an example, if someone were to say that s/he is a creationist, the expectation may be for him/her to speak in that manner, such as referring to Christianity, referencing the Bible, and other indicators of that discourse. If that creationist was also a university student taking an introductory biology course from a biology professor, there may be a different discourse within a class involving Darwinism and evolution. For that student, s/he may be experiencing competing discourses where there is one reality within her/his faith, and a different reality while in biology class at university with respect to evolution, or, as Davies and Harré (1990) phrase it, "discourses can compete with each other or they can create distinct and incompatible versions of reality" (p. 45). In studying discourse, it may not be easy to distinguish the originating influences of a particular discourse. For instance, to return to the example of the creationist university student, her/his view may originate from church teachings, parental guidance, independent reading, or other foundations. Since the exact origin is difficult to ascertain, Gee's (2011b) view of discourse as language-in-use in oral or written format is used in my study. The way I use discourse is an analytical framework of the data that aligns with Gee and Handford (2012), "discourse analysis is the study of language in use…it is the study of the meanings we give language and the actions we carry out when we use language in specific contexts" (p. 1). The purpose of using discourse analysis

is to illuminate aspects of an individual's identity based upon questionnaire and interview data.

Further details of this analytical framework are explained in the following chapter.

3.3.4 Practice

To better understand communities, it may help for a researcher to participate within the community being studied. For Lave and Wenger (1991) participating in a social practice emphasizes a person's status as an associate of a sociocultural community and as an associate, her/his view derives from activity by particular people in particular contexts. Lemke (2001) extends this notion by considering communication, behaviour, values, and beliefs as characteristic of the various communities we have experienced. To participate is to negotiate and renegotiate what meaning our participation has upon ourselves and it is a process where "understanding and experience are in constant interaction…are mutually constitutive" (Lave & Wenger, 1991, p. 51-52). As an illustration, consider someone new to hiking who joins a hiking group. The more experience s/he gains in hiking, the greater their understanding about hiking; the greater their understanding, the more this informs their experience, and so on. Because this new hiker is gaining knowledge and experience by participating in a hiking group, s/he is learning as an individual and becoming a new kind of person as a result of taking part in a collective activity with other practitioners; that is, a collaborative view built with a community of practice (Gee & Green, 1998). This is best described by Lave and Wenger (1991),

> A community of practice is a set of relations among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice. A community of practice is an intrinsic condition for the existence of knowledge, not least because it provides the interpretive support necessary for making sense of its heritage. Thus, participation in the cultural practice in which any knowledge exists is an epistemological principle of learning. The social structure of this practice, its power relations, and its conditions for legitimacy define possibilities for learning (i.e., for legitimate peripheral participation). (p. 98)

Participating within a community of practice is learning, and the degree of participation may impact the degree of learning. From their seminal work, *Situated learning: Legitimate peripheral participation* (1991), Lave and Wenger explain that legitimate peripheral participation is a process that is the main defining attribute of learning as situated activity. They describe that process as one in which participants increasingly take part in activities with more experienced members in communities of practice to reach full participation, i.e. so that their knowledge and skill increases, allowing them to develop from novice to mastery levels "in the sociocultural practices of a community" (p. 29). Because social practice is grounded in sociocultural context, they are continuously informing, shaping, and influencing one another. From this perspective, participating within a community of practice clearly demonstrates the mutually co-constructive relationship between practice and sociocultural context.

3.3.5 One-on-One Relationships

3.3.5.1 Identity and Sociocultural Context

Identity and sociocultural elements simultaneously co-construct one another. This aligns with Holland et al. (1998) who viewed the development of identity from a sociocultural perspective "of living in, through, and around the cultural forms practiced in social life" (p. 8). Rather than developing identity, Holland et al. (1998) saw identity as combining the personal world with social relations and cultural forms. While these definitions linked social and cultural elements with identity, Davies and Harré (1990) linked social elements to recognition. They consider social elements to be so compelling that recognition can only occur within their confines. As an example, consider identity and the sociocultural elements of a school principal. The sociocultural elements such as the organizational structure of the institution, the provincial

and school board rules for the administration staff of a school, and other elements, construct an identity of a principal. This is established through the institution's laws, rules, and regulations, such as the professional experience, conduct, and education required to be a principal. From an identity perspective, the identity of a principal constructs the staff organization of the school, the school's relationship with the community, school events, and other elements. This resonates with Holland et al. (1998) as they viewed identities as the foundation for the creation of new ways of being in the world, new worlds, and new practices and activities. Neither perspective of sociocultural elements nor identity exist in isolation from one another; instead, they co-construct each other.

3.3.5.2 Identity and Activity or Practice

A second element that identity co-constructs with is practice and activity. Within the sociohistorical school, an activity "refers to any historically specific, collectively developed or conventionalized, social endeavour such as work" (Holland et al., 2001, p. 177). Practice "mediates between objectivism (environment) and subjectivism (person or group) (Holland et al., 2001, p. 39). For example, teaching may be considered as an activity since it is collectively developed and conventionalized. The curriculum may be developed by the government, and there may be a convention where teachers must be certified prior to professionally teaching. Conversely, practice may be what teachers decide to do in their classrooms, but is tempered by activity, such as following curriculum guidelines, or only using certain text books, and other constraints. It needs to be noted that practices can be considered as part of sociocultural elements and this resonates with Gee's (2011a) definition of practice, "a socially recognized and institutionally or culturally supported endeavour that usually involves sequencing or combining

actions in certain specified ways" (p. 17). Additionally, this also resonates with Gee and Green

(1998), who describe activity building as one of the dimensions of social activity. Within the

context of my study, my participants' understanding of the activity of science teaching led them

to include the outdoors with their practice. Part of the purpose of my study is to understand

whether the participants consider teaching in the outdoors as an activity unto itself, or if it is a

practice based on their understanding of the activity of science teaching.

3.3.5.3 Identity and Discourse

Since discourse was just described, we will now turn to its relationship with identity.

Discourse and identity are mutually co-constructive. This is best exemplified by Gee, Allen, and

Clinton (2001), who state that "the relationship between language and identity is reciprocal" (p.

175). When a person talks, their speech may not represent that person as a whole. According to

Davies and Harré (1990), when people talk, they reveal beliefs that may not represent the whole

person and as their discourse shifts, so does their self-perception. To witness one and the same

person engaging in different discourses is akin to seeing their different identities. If we return to

the example of the creationist who is also a university student in a biology course, the way that

s/he speaks at home may represent a different identity from the identity, and associated language,

that the individual uses inside the biology class. Since a person may participate in different

discourses, that person can be said to have different or multiple identities and according to a

study by Davies and Harré (1990), these identities may not cohere with one another. The study

uses the expression 'position' when referring to multiple identities produced from discourse,

such as participants in a conversation. Furthermore, the study explains that once a person

subscribes to a certain position within a particular context or interaction, s/he can only see

through the lens of that position, such as the associated metaphors, imagery, and concepts situated within that discourse. This is important to my study because I am using discourse analysis to illustrate teachers' views of pedagogy and their understanding of their teaching practice, that is, their identity as a biology teacher who incorporates the outdoors.

3.3.5.4 Activity (or Practice) and Sociocultural Context

Practice (or activity) and sociocultural context are simultaneously co-constructive. As mentioned earlier in this chapter, activities are grounded in the sociocultural realm. From a sociohistorical view, activity "refers to any historically specific, collectively developed or conventionalized, social endeavour such as work" (Holland et al., 1998, p. 177). This aligns with Lave and Wenger's (1991) view that the historical progression of current activity is the foundation for a theory of learning, practice, and communication with and in the social world. Additionally, they consider a theory of social practice as one where thought, knowledge, and learning originate from a socially and culturally constructed world. From this perspective, all activity is based upon a sociocultural foundation. Because my study involves science education, I turn to Lemke's (2001) work, "Articulating communities: Sociocultural perspectives on science education". For him, this perspective refers to "viewing human social activities conducted within institutional and cultural frameworks" (p. 296). He further describes these social activities as examining and valuing social interactions in science pedagogy and learning, and viewing science as intertwined with its social context. He explains that people understand and make sense of the world and experiences using the tools derived from social groups, and these tools are the basis for a community's culture. Lemke considers sociocultural approaches as a way of comprehending social relationships and cultures within classroom communities; that a

sociocultural perspective encourages the application of science teaching to focus on the needs of the classroom community, and how teachers and students must comprehend the communities and cultures that science and science education are part of, both within and outside the classroom.

3.3.5.5 Activity (or Practice) and Discourse

Another direct relationship that will be described is between practice and discourse. In accordance with the other one-on-one relationships, this is also mutually co-constructive. In an earlier paragraph, learning was used as an example of the co-constructive relationship between sociocultural context and practice. Additionally, learning may also be used as an example of the same kind of relationship between discourse and practice. This aligns with Lave and Wenger (1991), "language is part of practice, and it is in practice that people learn" (p. 85). This concept is also illustrated in Lemke's (2001) study in which he describes an earlier study in 1978 using discourse analysis from a social linguistics view to examine talk as the vehicle for communicating science concepts in science class interactions. Part of his findings found that talk revealed the negotiations of social relationships between teacher and students, and the misunderstandings and miscommunication that can occur within the science classroom. Because this study reveals the necessity of discourse when learning science (a practice), it also shows that a student cannot fully participate in learning science without speaking its language. That is, discourse and practice co-construct one another.

3.3.5.6 Discourse and Sociocultural Context

One aspect of this relationship can be described as language-in-society and according to Gee (2008), there is no single correct way of elucidating all the nuances and functions of language in society. Lemke (2001) takes a sociolinguistic view in which language is situated socially and culturally, and contributes as one source for creating meaningful verbal action. In this way, language has a foundation in sociocultural contexts since it can be described as reflective of "ideological and lived perspectives on the world" (Holland et al., 1998, p. 170) or attached to "social relations, cultural models, power and politics, perspectives on experience, values and attitudes, as well as things and places in the world" (Gee, 2008, p. 1). Holland et al. (1998) applies these concepts to people to describe discourses as institutionally, interpersonally, and internally imprinted upon people. However, to use discourse as an analytical lens, recognition is needed. Gee and Green (1998) address this issue by describing engagement in dialogue where the participants involved must recognize and comprehend actions and intentions of the speaker.

This process of recognition and comprehension may be somewhat challenging due to the heteroglossic nature of language (Holland et al., 1998). That is, different words and phrases from different social languages may be mixed together in a particular way to appear as a single language (Holland et al., 1998; Gee, 2008; Gee, 2011b). Heteroglossia in conjunction with recognition demonstrates that language is grounded in social and cultural settings, and that they mutually shape and create one another.

3.3.6 Three-Way Relationships

3.3.6.1 Identity and Sociocultural Context and Activity (or Practice)

Identity, sociocultural context, and activity all simultaneously shape and develop one another. Holland et al. (1998) describe two aspects of activities in their study. First, the study asserts that activities are historically constructed within social and cultural contexts that are the foundation for people's development. Second, the study describes the significance of activities as contributing towards characterizing a social and cultural model, including its definition, members, and institutions or organizations. Yet, these models are not static. For Gee and Green (1998), this fluidity is due to members' negotiations and re-negotiations within those models. Because members can potentially change cultural models, another way to view this concept is that identities change with respect to these models (Holland et al., 1998). A big picture view, such as the one from those researchers, is that identity, activity, and sociocultural contexts co-develop one another.

3.3.6.2 Identity and Sociocultural Context and Discourse

Another multi-directional co-constructive relationship is between identity, sociocultural contexts, and discourse. The way that they interact is exemplified from Davies and Harré's (1990) description of the creation of a person, "through the process of social interaction, not as a relatively fixed end product but as one who is constituted and reconstituted through the various discursive practices in which they participate" (p. 46). This aligns with Holland et al. (1998) who consider discourses as the main factor that characterizes people. Furthermore, they also view the co-development of identities and discourses as contributing towards continual cultural production.

3.3.6.3 Identity and Discourse and Activity (or Practice)

Identity, discourse, and activity also share a mutual co-development relationship. As an example, consider Gee's (2011a) view on languages, "Language allows us to be things. It allows us to take on different socially significant identities" (p. 2). While this does not directly mention activity, recall earlier in this chapter the discussion that discourse and activity are simultaneously co-constructive. Because of that relationship, a rephrasing of his view is 'language, while influenced by and influencing activity, allows us to enact different socially significant identities.' The rephrasing clarifies the simultaneous effect that these elements have upon each other.

3.3.6.4 Discourse and Activity (or Practice) and Sociocultural Context

The final three-way relationship is between discourse, practice, and sociocultural context. To further examine this relationship, we draw on our previous discussion a few paragraphs ago that language is heteroglossic. Due to its combination of multiple social languages, language is intimately integrated and bound with ideology (Gee, 2008; Gee & Green, 1998). For Lemke (2001) culture communicates language to produce meaning in a social context. Gee and Green (1998) take this notion further by viewing language as echoing reality, and building it from a particular view. To put it differently, language is reflexive in the sense that it reflects and builds context at the same time (Gee, 2011a). This aligns with New London Group's (1996) view of discourse where it builds reality according to certain views and certain interests. However, building this view requires more than an individual, it requires a social group whose members negotiate definitions, norms, and values, as standards for their group (Gee & Green, 1998; Gee & Handford, 2012). From this view, different social groups may have different discourses, such as a discourse for gamers, gang members, biology teachers, and other social groups. Therefore,

discourse analysis examines language and social practice in the context of various social groups that collectively may be referred to as communities of practice, cultures, networks, and additional terms (Gee & Handford, 2012). Because discourse analysis includes practice with language, our actions and words are viewed as a unit rather than separate pieces (Gee, 2011a). As an example, consider learning in terms of a sociocultural context. In this context, learning is about the level of participation in activities associated with a community of practitioners (Gee & Green, 1998; Lave & Wenger, 1991). If that community is comprised of scientists and science educators, then the level of participation may be indicated by scientific activities, practices, literacy, and discourse (Lemke, 2001).

3.4 Figured Worlds

Thus far, one-on-one and multi-directional relationships have been discussed. One way of connecting all of these relationships simultaneously is through figured worlds. Figured worlds form and are formed by the co-construction of discourses, activities and artifacts (Holland et al., 1998). The relation between figured worlds and identity will be discussed later in this chapter. Research conducted by Holland et al. (1998) contends that figured worlds situate meaning for activities, a way of structuring the organization of sociocultural groups including relationships, interactions, hierarchy and membership; ways for members to understand and guide their actions, and develop identities. The same research study further defines a figured world as "a socially and culturally constructed realm of interpretation in which particular characters and actors are recognized, significance is assigned to certain acts, and particular outcomes are valued over others" (p. 52). That is, the population of a figured world has different roles oriented to its ideology while being grounded in a sociocultural context. The research study affirms that

figured worlds are evident in activities and practices so that members of these worlds are influenced by particular motivations for them to participate in certain acts.

For Gee (2011b) a figured world is "a picture of a simplified world that captures what is taken to be typical or normal" (p. 170), with the resulting viewpoint that typical or normal refers to what is appropriate or good within that figured world. Gee also cites "'folk theories,' 'frames,' 'scenarios,' 'scripts,' 'mental models,' 'cultural models,' and 'Discourse models,'" as synonymous with figured worlds.

3.4.1 Cultural Models

According to Gee and Green (1998) a cultural model is shared by a group of people who are members of a specific cultural or social group and may partake in the same theories, viewpoints, and discourse. Cultural models clarify and set the boundaries for the norms and language of a social group (Gee & Green, 1998). These researchers further explain that these models act as a framework to guide current members and set the developmental structure for new members, such as parenting or gaming or other cultural processes. In addition, they attribute activities and growth to the cultural model as coming from within, that is, through members' interactions, and negotiations of the views, characteristics, and values of the group; in turn, these also become part of the social practices of the group. By comparing this description of cultural models to the description of figured worlds, they are the same in terms of sociocultural context; forming and shaping relationships, actions, and members' views; constructing, organizing, and shaping that world; and having specific practices and activities. Within my study, the term "figured world" will be used as opposed to any other term such as "cultural model" to emphasize that through continued participation, the figured world becomes more embodied, and moreover,

53

through participation, the figured world is renewed through the participants' practices (Holland et al., 1998).

3.4.2 Activities

Through participants' engagement in activities, figured worlds become realized, shaped, modified, and re-created (Holland et al., 1998). In accordance with these researchers, figured worlds emphasize activity and differentiate from a group's culture, ex. a group of people adhering to the same views in any setting. Additionally, members of figured worlds have different levels of participation that result in different levels of knowledge that cause different perspectives about their figured world. This aligns with Gee (2011b), who correlates people's differing experiences and changes in society with people's different views of what they consider to be typical. In addition, other differences in perspective may be found in other contexts and/or other social groups who each have their own notion of what is typical of their world. He also describes a figured world as a simplified model of what is thought of as typical, anyone or anything outside of what is "typical" may be criticized as "untypical" (Gee, 2011b). However, these atypical instantiations contribute towards further clarifying what is typical within those figured worlds. For example, within the figured world of biology teaching, there may be differences that lead to other worlds showing that there are multiple figured worlds of biology teaching, such as biology teachers who include outdoor settings and those who do not. Because people's experiences, society, and people themselves are not static, neither are figured worlds (Gee, 2011b).

3.4.3 As a Research Tool for Identity

Due to their foundation in sociocultural contexts and emphasis upon activities and members' participation, figured worlds may be used as a research tool for identity. This is best described by Urrieta (2007), "Figured worlds…is a useful as a tool for studying identity production in education, particular sociocultural constructs in education, local educational contexts, and can also be used as a practical tool for crafting figured worlds of possibility" (p. 112). Furthermore, because members orient their views and interactions to the figured world they participate in, he relates identity to figured worlds. This aligns with Holland et al. (1998) whose study connects identity with participation in collectively formed sociocultural activities that are part of figured worlds. In terms of identity development within these worlds, the study considers several points: figured worlds are historical in that they continue to develop through participants' participation; due to the social interactions involved, positioning is significant in these worlds; the social context re-creates and structures figured worlds; and overall, figured worlds provide the context for understanding and voice. For these researchers, identity is characteristic of societies and its creation and development occurs through participation in their position in social-historical activities. Another way Holland et al. phrase this concept is that figured worlds are the historical sociocultural landscape for collective dialectical and dialogical identity formation in practice. However, they additionally describe identities as fluid due to the new understandings and experiences formed in continued participation in social activities. Furthermore, they attribute this fluidity as contributing towards new activities and new figured worlds. This discussion of figured worlds and identity is best summed up by Urrieta (2007), "figured worlds are intimately tied to identity work". (p. 107)

3.5 Big "D" Discourse

It needs to be noted that the Capital "D" Discourse (Discourse) model is not synonymous with figured worlds. Instead, "Discourses are ways of behaving, interacting, valuing, thinking, believing, speaking, and often reading and writing, that are accepted as instantiations of particular identities (or "types of people") by specific groups" that may include teachers of a certain type, such as those who incorporate outdoor settings with their science teaching (Gee, 2008, p. 3). Discourses result from social histories and are socially situated identities (Gee, 2008, p. 3). Furthermore, from this sociohistorical view, every Discourse can be thought of as a collection of ideas that characterize a "typical" person and "the 'right' ways to think, feel and behave" (p. 4) as that kind of person. Additionally, as social beings, we are part of different Discourses. For example, one and the same person can be a teacher, a parent, a pet owner, and other types of people. Big "D" Discourses will be discussed further in Chapter X.

3.6 Gee's Discourse Analysis

Thus far, this chapter has examined the theoretical framework of exploring the relationship between teacher identity and inclusion of outdoor settings. Since the type of discourse used is heavily influenced from Gee's work, it is necessary to discuss why his view was chosen. Prior to that discussion, a closer look at contributing theories upon his work follows.

3.6.1 Contributing Theories

Although this study heavily draws from Gee's (2011b) work "How to do discourse analysis: A toolkit," his work is inclusive of theories from other researchers. Their contributions are significant because they emphasize the sociocultural context. The corollary is that Gee's

view is a more detailed picture of the relationship between discourse and identity. This section further examines those contributing theories.

3.6.1.1 Bakhtin (1986)

The discourse tools that best exemplify the sociocultural context are the Social Language Tool, the Doing, Not Just Saying Tool, and the Situated Meaning Tool (used to determine whether the actions of a language matched its communication, see Appendix X) (Gee, 2011b). Gee (2008) describes social languages as "impure" due to the use of combining social languages in text or speech. He attributes this notion to the theory of "heteroglossia' from Mikhail Bakhtin. Heteroglossia from Bakhtin refers to the combination of different languages and competing ideological perspectives within the same communication, and it can be used to illuminate social diversity in language, ex. its historical, political, and social implications (Blackledge & Creese, 2014).

In addition, Bakhtin's influence upon Gee's work also extended to situated meaning. For a text to be meaningful, it intersects with certain words, thoughts, tools, objects, deeds, at a certain place and time in combination with other bits of language (Gee, 2008). This aligns with Bakhtin's (1986) emphasis upon context, that every communication has echoes from its predecessors and changes within it, and without context, all of that is lost and becomes foreign. Gee (2008) extends that notion by applying it to social action within a communication, that it only has meaning when at the intersection of different Discourses.

Another effect from Bakhtin is differentiating between grammar and style, especially within social language. Frequently, the term "language" may be used to refer to grammar, the "rules" or structure of a language (Gee, 2008). Yet, Bakhtin (1986) is careful to point out that

grammar and lexicon differ from the stylistics of a language. To explicate that idea, Gee (2008) describes that a person may know grammar but not know how to use a language. In addition, rather than speaking grammatically, it is more important to say the "right" things at the appropriate time and place. Moreover, within socially situated language, there must be a congruency between words and actions including beliefs, attitudes, and values. That is, there is an alignment between a type of person and their communication and actions. Gee (2008) refers to this alignment as Discourses with a capital "D" (while "d" discourses are in reference to language-in-use).

Cumulatively, Bakhtin's (1986) notion of heteroglossia, context, and grammar influenced Gee's (2008) work on social language, situated meaning, and demarcating between grammar and language. This influence is seen in the notion of the presence of multiple languages within the same communication, that context is needed to fully grasp the social implications and nuances in speech (whether written or spoken), and that the rules of structuring a language are not the same as its style. Without Bakhtin's (1986) work, the deeper social meanings and implications within language may not have been as explicated as they are in Gee's work (2008, 2011b).

3.6.1.2 Holland, Lachicotte Jr., Skinner, and Cain (1998)

Other theorists that contributed towards Gee's work include Holland et al.'s (1998) theory of figured worlds. This is readily seen in Gee's (2011b) discourse tool "Figured Worlds" (what is considered to be typical within a given world, see Appendix X). Gee (2011a) describes a figured world as a "picture of a simplified world that captures what is taken to be typical or normal" (p. 71). His definition is succinct when compared to that of Holland et al. (1998):

> We mean a socially and culturally constructed realm of interpretation in which particular characters and actors are recognized, significance is assigned to certain acts, and

particular outcomes are valued over others. Each is a simplified world populated by a set of agents…who engage in a limited range of meaningful acts or changes of state…as moved by a specific set of forces (p. 52).

Moreover, these agents are certain types, figures, and characters who accomplish tasks and have particular orientations, views, and ways of interacting within that figured world. In other words, a figured world is akin to a model bounded by a certain culture populated with those whose views, beliefs, attitudes, and actions align with that cultural context.

When describing the activities of a figured world, Holland et al.'s (1998) work also affected Gee's (2011b) discourse tools—The Activities Building Tool and The Identities Building Tool (a group with a specific identity that is recognized by their participation in specific activities, see Appendix X). Figured worlds are socially reproduced and organized so that the activities and events that occur within them guide their formation and reformation (Holland et al., 1998). Since each figured world can be considered separate, the activities occurring within it are particular to that figured world while other activities may be specific to other figured worlds.

In addition to activities, social systems may also be aligned with certain figured worlds and in this way, Holland et al.'s (1998) work continues to affect Gee's (2011b) discourse tools, especially Social Language Tool and Doing, Not Just Saying Tool, and Situated Meaning Tool (this helps determine whether actions match the communication, see Appendix B. Figured worlds are affected and bounded by history in that the populace of these worlds bring with them certain history and social encounters where their positions may be important (Holland et al., 1998). Furthermore, these encounters have a social context and occur during specific times and places. And due to their social nature, some figured worlds may be "off limits" or not entered by others because of their rank or social position. In this way, figured worlds are co-produced or co-created through social systems, activities, discourses, artifacts and others.

By examining Holland et al.'s (1998) work on figured worlds, we can better understand Gee's (2011b) discourse tool, "Figured Worlds" (see Appendix X). Since society is not static, this implies that socially situated activities, systems, discourses, and other socially-related processes are not static (Gee, 2011a). Also, since figured worlds are co-created with social systems, and those systems are always changing, figured worlds also change with them. Because figured worlds are synchronous with changes in social systems, they offer a way of examining discourse for what is taken to be typical or usual within that world bounded by context and time.

In sum, figured worlds from Holland et al. (1998) contributed towards Gee's (2011a, b) work by illuminating the typical or norm within a world, deepening the understanding of the way social positions and activities are socially situated and connected with one another. If not for Holland et al.'s (1998) work, Gee's (2011a, b) discourse tools may not have included figured worlds, or norms or what is considered typical within those worlds.

3.6.1.3 Taylor (1994)

Taylor (1994) is another theorist who impacted Gee's work. Specifically, Taylor's (1994) explanation of identity being dependent upon discourse with others demonstrated a connection between discourse and identity. That is, to recognize identity, an interpretive system, such as discourse, is needed (Gee, 2001). By viewing discourse as a means of recognizing identity, Taylor (1994) contributes towards Gee's (2011a, b) notion of specific identities having specific discourses.

3.6.1.4 Hacking (1986)

An additional researcher that contributed towards Gee's (2011a, b) idea of a type of person is Hacking (1986). One way of being a different kind of person is through Discourse (Gee, 2011a). However, this is only achieved in particular social setting at a particular time and place (Hacking, 1986). That is, dependent upon the situation, people may have certain socially meaningful identities as evidenced through their social language in conjunction with their interactions, actions, values, beliefs, and thoughts, while using different tools, objects, and technologies (Gee, 2011a). Hacking's (1986) input to Gee's (2011a) work is through his connection of a type of person with a specific social situation bounded by time and location. This is similar to Bakhtin's (1986) notion of context if it was extended in application to identity. In the same way that social language is bounded by time, place, and context, so too is social identity. If not for Hacking (1986), there is not a direct connection between identity and context and this would produce a more shallow view of identity.

3.6.1.5 Lave and Wenger (1991)

Lave and Wenger (1991) also influenced Gee's (2001) work. For example, their theory, "Communities of Practice" can be considered a part of what Gee (2001) refers to as Discourse. According to that pair of researchers, "a community of practice is a set of relations among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice" (p. 98). From this definition, it is clear they are connecting people-activity-sociocultural setting (world)-time-social interactions. That connection is analogous to Gee's (2008) notion of big "D" Discourse (the intersection of a person's actions and communication) since they both link people with social setting and communication. One

difference is that communities of practice seems to emphasize how groups of people (communities) have an effect upon, and are affected by, other groups while Discourse seems to focus on the individual since no other people are mentioned. Without Lave and Wenger's (1991) influence upon Gee's (2008) work, the applicability of Discourses to groups may not be as evident.

3.6.1.6 Summary

While not exhaustive, this section has shown that other theories have contributed to Gee's (2001, 2008, 2011ab) work on discourse and identity. Because Gee had chosen to implement their theories, his views culminate into a deeper and richer perspective on discourse and identity when compared to the contributing work in isolation. Consider the way that Bakhtin's (1986) work (e.g. heteroglossia, context, the difference between grammar and style), Holland et al.'s (1998) research (e.g. figured worlds, activities, social position), Taylor's (1994) relation of identity recognition with discourse, Hacking's (1986) description of a kind of person, and Lave and Wenger's (1991) communities of practice cumulatively enrich the perspective on discourse and identity by emphasizing the effect of sociocultural context (such as multiple languages within the same communication, what is considered typical, activities, interactions, social position, time and place, and effects on and from groups), differentiating grammar from language style, and connecting identity recognition with discourse, respectively. Table 3.1 summarizes these theories and their effects upon Gee's work. If not for the inclusion of their theories, the remaining view on discourse and identity would distinctly lack the effect of the sociocultural context and would be shallow.

Table 3.1

Other researchers that Gee drew upon and how he used their ideas.

Researcher	Idea	Gee's use
Bakhtin (1986)	• Heteroglossia and linguistic style • Language and its meaning • Grammar differs from language style	• Contributes to The Social Languages Tool • Includes time and place to situated meaning • Helps separate grammatical from discourse tools
Holland, Lachicotte Jr., Skinner, and Cain (1998)	• Social positioning • Figured Worlds • Activities	• Assists in deepening Significance and Social Languages Tool • Is the foundation for The Figured Worlds Tool • Fortifies The Activities Tool
Taylor (1994)	• Recognition through dialogue	• Helps fortify the relationship between discourse and identity
Hacking (1986)	• Being a person at a certain time, place, social setting	• Helps inform notion of a kind of person
Lave and Wenger (1991)	• Communities of practice; kind of person; participant in social practice	• Informs view of identity and its definition

3.6.2 Why Gee's Discourse Analysis Was Chosen

This study explores the relationship between teacher identity and their integration of the outdoors. Discourse was used as an analytical lens to further our understanding of that relationship. Because this study connects identity, practice, and discourse, Gee's theories of discourse and identity were applied for a few reasons.

Earlier in this chapter, the co-construction between identity, sociocultural context, discourse and activity (or practice) was discussed. The significance of that co-construction is to emphasize that identity does not exist in isolation. Gee's (2011a) definition of identity addresses

this by relating identity to time, place, and purpose, where purpose may be subject to sociocultural factors while other definitions of identity (as described earlier in this chapter) did not directly mention context. That definition of identity applies to exploring the relation between identity and practice because it highlights that they co-exist rather than being linear such as a causal view. For instance, teacher identity and their teaching may simultaneously affect one another.

Another significance of that co-construction is that its intersection is indicative of a type of group and/or person. That is synonymous with Gee's notion of big "D" Discourse where the intersection combines a particular way of valuing, interacting, believing, behaving, speaking, and communicating to indicate a kind of person or group. As an example, while participants in my study are considered as part of a group of biology teachers, they are also part of another group – biology teachers who include outdoor settings with their teaching. This study seeks to explore the intersection between their identity and practice. One method of pursuing that exploration is by considering Discourse so they may be better described as a kind of person and/or group.

The previous section described the ways that other researchers' theories contributed towards Gee's notions of identity and d/Discourse. Since Gee had included theories that emphasize the sociocultural context, separate language style from grammar, and connect recognition with discourse, his views culminate to a more vivid picture of the relationship between teacher identity and their practice. In turn, using those views illustrates a clearer picture of that relationship.

Overall, Gee's discourse analysis was the most applicable for my study. Because this study seeks to explore the connection between biology teachers' identities and their inclusion of outdoor settings, the reasons behind their pedagogical decisions and the settings of those

decisions need to be included. His is the only definition that directly includes context and purpose when viewing identity (Gee, 2011a). However, my dissertation research also seeks common coherences among the participants, that is, whether they can be thought of as a type of group or individually as a type of biology teacher with a specific practice. Big "D" Discourse (Gee, 2008, 2011b) emphasizes a type of person or group based on the intersection among their communications, actions, interactions, values, beliefs, and behaviours, as bounded by a sociocultural and sociohistorical context. Since the theoretical framework of this thesis is the co-construction between identity, sociocultural context, discourse, and activity (or practice), a deeper and clearer view is needed. Gee's inclusion of other theories enriches the perspective of this co-construction. For these reasons, Gee's discourse analysis is the most applicable when exploring the relationship between biology teacher identity and their practice.

3.7 Summary

In sum, this chapter described the theoretical framework to exploring the relation between the identities of biology teachers and their inclusion of outdoor settings with their practice. The historical perspectives of identity demonstrate that a postmodern stance on identity was the most applicable since it addresses outside influences upon self-authored identity. Rather than examining identity in isolation, this study considers identity as co-constructed with sociocultural context, discourse, and activity (or practice). The different combinations of relationships within that co-construction were described, culminating in figured worlds where any norms or what is considered typical in biology teaching will be explained. In turn, both of those led to big "D" Discourse that indicates a type of person or group based on the intersection among communicating, acting, believing, behaving, valuing, and interacting, as bounded by

sociocultural and sociohistorical context. Lastly, this chapter further examined Gee's discourse analysis in terms of other contributing theories and why his views were most pertinent to this study. The way that this research was conducted ensues in the following chapter.

Chapter 4

Research Methodology

4.1 Design and Procedures

4.1.1 Reflection on Choosing a Qualitative Approach

During the initial stages of searching for a dissertation topic, I reflected upon my experiences as a high school biology teacher. The experiences that resonated most strongly with me were the times I had incorporated the outdoors with my teaching practice. These experiences were the most memorable to me because of student enjoyment and the bond I developed with students from those events. My reflections made me question why other science teachers (like many of my colleagues and former science educators) did not include the outdoors more frequently in their practice. I reflected upon the way I was taught to teach science during my pre-service education and to the early experiences I had teaching in the outdoors. I started to wonder why some teachers, such as myself, decided to incorporate the outdoors with their practice while others chose to remain indoors inside the classroom.

As this study started to take shape, it was heading towards a qualitative paradigm because I wanted to broadly explore the reasons for committing to outdoor teaching rather than focusing upon causal determination (Golafshani, 2003; Stake, 2006). Qualitative research seeks deeper understanding of a phenomena while being mindful of the context, does not use quantification, limits positivist views, emphasizes participants' views, makes use of rich description, and is amenable towards postmodern perspectives (Golafshani, 2003; Harrison, Birks, Franklin and Mills, 2017; Merriam, 1998; Stake, 2006).

During the initial stages of my doctoral research my initial research questions emphasize understanding the way teachers conceive of and make sense of their teaching practice (e.g., what would make a teacher choose to include the outdoors? What would influence or guide her/him to

67

leave the classroom and use other settings for teaching?). This orientation aligns with the focus

of qualitative research where attention is centered upon comprehending a phenomenon from the

participants' view as opposed to that of the researcher (Merriam, 1998). In trying to think of

how to answer these questions, this led me to consider teacher identity. Within this study,

identity is used as a framework for teachers' pedagogical decisions and way of being within the

context of time, place, and purpose (Gee, 2011a).

In trying to answer those questions, I faced the issue of how to study teacher identity.

After all, it is intangible and non-empirical. Initially, I thought of identity as something "inside"

of a teacher that must be "revealed" in some way. My first thought was to interview participants,

so they may "reveal" their identity through discourse. As the study developed, however, I came

to understand the relationship between discourse and identity as mutually co-constructive since

language and identity are reciprocal to one another (Gee, Allen, & Clinton, 2001). This led me

to choose reflective interviews as the primary source of data collection, providing an opportunity

for the participants to share their experiences of incorporating the outdoors in detail and to

explore these experiences in a conversation with me (Turner III, 2010). Interviews provide a

rich opportunity of social, discursive interactions focusing upon the perspectives and experiences

of participants.

Yet, as Myers and Newman (2007) point out, the challenges of using qualitative

interviews for collecting data need to be acknowledged. However, in my study, I addressed

those challenges in several ways. Firstly, because I had met the participants prior to the

interviews, they were somewhat familiar with me, which addressed the potential artificiality of

the interview and contributed towards a more "natural" interview and building of trust. Secondly,

the use of multiple interviews countered time limitations (there was an opportunity for further

commentary and questions from the research and participants), ambiguity of language (there was time for clarification of questions and/or responses), and potential misunderstandings (there was a chance for clarifications). In addition, using more than one interview contributed to obtaining optimal responses since participants have time to reflect upon their responses and to add any details and/or explanations and to ask any questions (Turner III, 2010).

Other than being aware of the strengths and weaknesses of using qualitative interviews, it was also necessary to specify the type of qualitative interview that would be implemented. I wanted each participant to provide as much detail as possible with their responses, and to give them the chance to ask me any questions. To accomplish this goal, I determined that each interview would have to be one-on-one, customized for each participant, e.g. by my preparing questions ahead of time. I also decided that there would have to be some flexibility for me and the participants to ask any questions spontaneously, such as clarification and/or follow-up questions.

To satisfy these factors, a semi-structured or general interview guide approach was selected as being most suitable. This approach allows for preparation of some questions prior to the interview, flexibility in the way questions are posed, such as improvisation, and a conversational style so that responses may "flow naturally" (Myers & Newman, 2007; Turner III, 2010). An unstructured interview, "informal conversational," was not a match for the purposes of my research since it relies on complete spontaneity of questioning and this would be too much of a challenge without any questions prepared in advance (Turner III, 2010). In addition, the structured or standardized open-ended interview was not suitable since it does not allow for any flexibility or improvisation—it is scripted so that the interview questions are identical for all participants (Myers & Newman, 2007; Turner III, 2010). A group interview was not chosen

because I wanted to maximize my time with each participant individually and I wanted to avoid their responses being influenced by any other teacher (Myers & Newman, 2007).

While considering using interviews as the main data sources, I began to initially consider language (discourse) as a manifestation or representation of identity. However, rather than a "representation," "co-construction" is a more accurate term since identity and language are reciprocal with one another (Gee et al., 2001). From this perspective, my view changed so that I considered identity to be co-constructed between myself and the participant during the interview process. This new viewpoint aligns with Gee (2011a) who considers language as a way of taking on identities. Also, the notion of co-construction aligns with qualitative research since the interview process is a social interaction where the involved individuals influence one another, meaning that reality is based upon the participants' perceptions (Creswell & Miller, 2000; Myers & Newman, 2007). Moreover, there is also alignment with constructivism, a paradigm of qualitative research, where reality is dependent upon perspective, knowledge is considered as being socially constructed, can vary based upon circumstances, and there may be plural realities (Baxter & Jack, 2008; Creswell & Miller, 2000; Golafshani, 2003).

Since my goal was to examine identity as it relates to the pedagogical decisions of incorporating the outdoors, the emphasis of this study is upon the view of the participants and this is complementary to qualitative research. Because I am trying to understand the meaning of their experiences, using qualitative interviews to collect data was a good fit (Merriam, 1998). Using the method of interviewing was especially fruitful for me to obtain data since my interactions guide the participants so they may describe in detail their experiences and views (Turner III, 2010). Here, the emphasis is upon the participants' perspectives rather than statistics and instruments that are more common to quantitative research.

Another way that the participants' view was emphasized was through member checking. This is when participants are shown any data or interpretations by the researchers, so they may affirm its credibility (Creswell & Miller, 2000). Additionally, according to Creswell and Miller, member checking aids in establishing validity, that is, how accurately the views of the participants are described. For instance, within my study, participants verified their transcripts for accuracy and could choose to omit any information they wanted to remain private. Only approved transcripts were used in this study. (The notion of validity is discussed further in Chapter 8.)

Because I wanted to examine the relationship between teacher identity and incorporation of outdoor learning environments, having multiple participants was ideal. This provided an opportunity for a cross-case analysis where common coherences could be found among the participants. Having more than one participant also aligned with constructivism because it values the notion that there are multiple realities within people's minds (Golafshani, 2003). It is important to note that the way discourse is used in this study also addresses these multiple realities since engaging in different discourses may be like engaging in different identities (Davies & Harré, 1990).

In sum, my study was best suited for a qualitative approach. For example, because this study explored the pedagogical reasons behind teachers' decisions to incorporate outdoor learning settings, there is a lack of emphasis upon causal determination. The corollary is that there is a focus upon participants' views. To obtain those views, semi-structured interviews provided an opportunity for the participants to share their experiences in detail through a conversation with me. Through that interview process, participants' identities were co-constructed with me through their discourse. The way that this study was undertaken aligns with

a qualitative approach since deeper understanding of the relationship between teacher identity and practice through teachers' views is sought via thick, rich description.

4.1.2 Case Study Approach

This study was conducted as a qualitative multiple case study. Prior to discussing multiple case study and case study, the demarcation between methodology and method needs to be addressed. Methodology is akin to a type of research. It can be thought of as a researcher's lens through which they view their study so that it forms the design of the case study (Harrison et al., 2017). For instance, according to Merriam (1998), qualitative research has five research types that share the same characteristics: to further understanding, the researcher is the main source for data collection and analysis (discussed later in 4.3.4 Data Collection), to include fieldwork, to use an inductive analysis, and to incorporate rich description. Those five research types are: basic or generic qualitative study (where the worldviews of the participants are sought); ethnography (seeking a description of a particular group of people's cultures including their behavior such as values, beliefs, and attitudes); phenomenology (focuses upon the experience of a certain phenomenon); grounded theory (the emphasis is upon developing a theory where its foundation is the data); and case study (an intrinsically bounded phenomenon). In contrast, a method may refer to certain means used in research to obtain data, such as interviews (Harrison et al., 2017). Therefore, within my study, case study was used as a qualitative approach since my objective was to further understand the relationship between identity and practice through inductive analysis, and thick description (as opposed to developing a theory in grounded theory or describing the experience of a phenomenon like phenomenology).

The significance of using case study to research complex issues in a real-world context has reified over the past 40 years (Harrison et al., 2017). Its history and development are best outlined by Harrison et al. (2017) and the following is a summary of that history. During the 1960s and 1970s, case study was viewed somewhat skeptically as it was considered limited in its application of generalizability of results but was used within quantitative studies. The corollary is a dichotomy of views where one supported positivism and quantitative methods while the other supported constructivist, interpretivist, and qualitative methods. However, with the emergence of grounded theory in the 1960s, qualitative field methods merged with quantitative data analysis methods that resulted in an interest in using case study. For instance, 1970s educational research used case study to evaluate curriculum design and change that led to policy, social, and educational change. Subsequently, 1980s and 1990s political science research integrated statistical and narrative methods with causal inference and case selection methods to develop and test theory. We now turn to defining a case study.

To study a "case" is an empirical study, and more than one definition of "case" is found in the literature. A case can be an integrated system which is intrinsically bounded, and the goal is the comprehension of intricate social phenomenon (Merriam, 1998; Stake, 1995, 2006). However, for Yin (2013), a case study is empirical since it deeply examines a phenomenon while taking into consideration its context. For simplification, Harrison et al. (2017) discuss a more simplified definition where a case study intensely analyzes a single unit emphasizing context, describing the ultimate goal of case study research as deeply analyzing an issue from the participants' view while tempering the analysis by context. An alternative view is from Stake (2006) who views case study as a simultaneous duality of process and product of inquiry. Also, he considers the case study's attention to context as its strength. They consider further

73

comprehension of a complex phenomenon bounded by real life context as a necessity to using

case study (Harrison et al., 2017; Stake, 2006). These purposes align with my study since I

sought to understand the relationship between identity and use of the outdoors from the teachers'

perspective while encompassed by their context.

A case study differs from the other types of inquiry since it is an in-depth empirical study

of a single phenomenon while accounting for its context, and using rich, thick description—this

is particularly important when the demarcation between the said phenomenon and context may

be blurred (Baxter & Jack, 2008; Creswell, 2003; Flyvbjerg, 2004, 2006; Langenbach, Vaughn

and Aagaard, 1994; Merriam, 1998; Ragin & Becker, 1992; Stake, 2006). Yin (2013) uses a

two-part definition, "a case study is an empirical inquiry that: (i) investigates a contemporary

phenomenon (the 'case') in depth and within its real-world context, especially when, (ii) the

boundaries between phenomenon and context may not be clearly evident" (p.16). His definition

demonstrates that there are particularities to the case study approach such as design, methods of

collecting and analyzing data that show case study as more than a way of collecting data or a

design feature. He contrasts other forms of inquiry, such as experimental or survey studies,

which may not fully explore context, while historical studies may not investigate contemporary

events. The significance of mentioning these other inquiry methods is to highlight the

differentiation of case study.

To better describe the difference between case study and other methodologies, Harrison

et al. (2017) explicate seven distinguishing characteristics which can be summarized as: (1) the

case; (2) a bounded system; (3) studied in context; (4) in-depth study; (5) selecting the case; (6)

multiple sources of evidence; and (7) case study design. Firstly, a case study must choose and

have a "case," the unit of interest, and this can range from an individual to a program or other

areas of study (the first and fifth characteristics). The second characteristic, this case is bounded

for framing and contextualization purposes. Afterwards, context must be taken into

consideration for furthering understanding of the study (third characteristic) and for its

contribution towards the deep analysis (fourth characteristic) of the issue. The sixth

characteristic, using a variety of data sources also contributes towards the analysis. Lastly, the

design of the case study may be either descriptive or explanatory. A descriptive case study is

written in great detail (Merriam, 1998). She further adds that a descriptive case study helps form

a foundation for the development of theories, aids with comparisons, and emphasizes presenting

basic information for initial research and novel programs and practices. In contrast, an

explanatory case study looks for understanding. This study is descriptive since it seeks to

describe the relationship between teacher identity and practice in as much detail as possible.

Since the preceding paragraphs highlighted the distinguishing characteristics of case

study, it is fruitful to consider the diverse types of case studies. Yin (2013) describes two broad

types of case studies. One type is a holistic design, and this is useful when the case has a holistic

nature and/or when there is a lack of subunits. In contrast, an embedded design has subunits and

those help narrow the case inquiry. My study is holistic since each case is a teacher and as such,

there is no "subunit" to a teacher.

All case studies have some kind of boundary, whether it be actual or theoretical (Merriam,

1998). As an example, this case study is bounded by the biology teachers and their context since

it is their identities within their surroundings that are being described. Each teacher is considered

as an individual case. Since there was more than one teacher and insights were sought from the

coherences among their identities, discourses, and practices, this research is a multiple case study.

A multiple case study is when data is collected and analyzed from several cases. This may also

be referred to as a collective or multiple case study (Merriam, 1998; Stake, 1995, 2006; Yin, 2013).

According to Baxter and Jack (2008), a rigorous qualitative case study (rigor is further explicated later in this section) uses multiple data sources to investigate a phenomenon with respect to its context. The use of various sources of data allows for different viewpoints of the phenomenon (the inclusion of diverse sources of data in my study is discussed further later in this chapter). Harrison et al. (2017) support this view by connecting multiple methods of data collection and analysis with a more comprehensive and synergistic view of the case study.

My study uses a multiple case study approach due to the uniqueness of the phenomenon, to provide rich, thick description, and contribute validity. A case study was selected for what it may reveal about a phenomenon, sometimes referred to as a quintain (Merriam, 1998; Stake, 2006). For convenience the term 'phenomenon' will be used henceforth. This research methodology is particularistic and descriptive so that the case study focuses upon one phenomenon in as much detail as possible (Merriam, 1998). Key factors characterizing my research as a multiple case study include using similar participants and treating each as a separate case (Stake, 2006; Yin, 2013).

Using multiple resources to collect data is complementary to constructivism, a paradigm of qualitative research (explained from the previous section). The term "relativism" espouses a similar perspective where multiple realities are valued—a form of support would be to use multiple methods of collecting data, allowing for representation of different realities that depend upon the observer (Creswell & Miller, 2000; Golafshani, 2003; Yin, 2013). Harrison et al. (2017) also use the term "interpretivist" as synonymous with "relativist"[1]. Harrison et al. (2017)

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[1] Some controversy surrounds the term "relativist" since its extreme position may indicate that there is no knowledge (Boghossian, 2007; Driver, Asoko, Leach, Scott & Mortimer, 1994).

contrast the "relativist" viewpoint with a "realist" or "positivist" view where there is a single reality that can be measured and studied. They highlight that because case study can be applied to either paradigm, it is versatile as an application for any research. Another related term for expressing a type of viewpoint is "naturalist," which differentiates from a positivist view since naturalist refers to: constructed and co-constructed (between researcher and participant), multiple realities; and accounting for time and context (Lincoln & Guba, 1984). Slightly parallel with Harrison et al., Lincoln and Guba espouse that the naturalistic paradigm aligns with nearly all types of phenomena since "we *are* like the world we see, and, more important, the world we see is like us" (p. 67, original emphasis). They argue that the naturalistic paradigm is a legitimate inquiry approach and matches well with case study inquiry. My study of biology teachers who incorporate the outdoors is supportive of a constructivist or relativist or naturalist and naturalistic perspective since the perspectives of each of the participants were captured using a questionnaire and qualitative interviews so that the focus is upon their views and those may contribute towards any coherences among the relationship between identity and practice.

The phenomenon under study is the integration of the outdoors into teaching practice by biology teachers. Biology teachers who choose to make this integration may be considered atypical or different from their more traditional colleagues. The reason to examine this phenomenon is supported by Barker et al.'s (2002) study finding that there is a decline in fieldwork for biology students, and there are fewer teachers who have experience with outdoor activities, indicating that they may be less inclined to implement those activities. In this way, these biology teachers might be considered atypical cases of the general phenomenon of biology teaching. Atypical cases contain a breadth of information since there are many factors which may be at play (Flyvbjerg, 2004, 2006; Hodkinson & Hodkinson, 2001). Atypical cases may

also reveal factors which were taken for granted in typical cases (Stake, 1995, 2006). For this study, it is more important to choose a few cases for their validity than to use representative random samples (Flyvbjerg, 2006). A multiple case study approach is most sensitive towards the uniqueness of each individual.

Similar to other research approaches, there are advantages and challenges to the methodologies chosen for my study. The benefits of using a multiple case study approach are its contributions to validity (see Chapter 8 for a detailed discussion), real life context and potential for theory building. A case study is focused upon a real-life situation and is grounded in reality (Flyvbjerg, 2004, 2006; Hodkinson & Hodkinson, 2001; Merriam, 1998). The participants described their identity and practice based upon their own concrete experiences. Case studies may illuminate how different concepts are related to one another in various ways and this can lead to detailed theories (Flyvbjerg, 2004, 2006; Hodkinson & Hodkinson, 2001). The multiple case study design allows for cross-case analysis to occur. Since case studies are useful for the beginning and exploratory stages of research, they contribute to the foundation of future studies (Merriam, 1998). It is hoped that this multiple case study will contribute towards understanding those innovative practices and the foundations of those practices.

Limitations of a multiple case study include the case study itself, the researcher, participants' recollections and reliability. Yin (2013), states that it is challenging to conduct a good case study since case study researchers do not operate with identical systematic procedures and therefore, there is no consistent procedural reference for comparison. Each researcher, including myself, is limited by their own sensitivity and bias (Hodkinson & Hodkinson, 2001; Merriam, 1998). Additionally, principal investigators are limited by their own skills at researching. Since the data was collected through interviews, it is crucial for the researcher to be

able to speak and listen attentively (Tannen, 1989). Another important element contributing to the case study value is the researcher's ability to interpret the data and to know the kinds of questions to ask to get the appropriate data. Moreover, the defined skills for conducting a good case study are not yet formally defined (Yin, 2013).

Another limitation is reliability, which is the extent to which research results may be duplicated while acknowledging biases (Merriam, 1998; Yin, 2013). Another term for reliability is "dependability," as supported by Lincoln and Guba (1984). A case study is very specific and is not easily generalized (Hodkinson & Hodkinson, 2001). Qualitative research seeks to understand the world by those who experience it, and since each individual has their own interpretation of what occurs, there is no reference point by which repeated measures, in the traditional quantitative sense, can be obtained (Merriam, 1998). According to Yin (2013), researchers have been dubious of the reliability of case studies since prior case study procedures were not well documented. Yin suggests using a case study protocol and database to address any documentation issues, and clarity of procedures, respectively. In that way, theoretically, any other researcher would be able to read that case study and conduct it with the same procedures to hopefully draw the same results. Due to the lack of repeated measures, the main emphasis is upon trustworthiness of the data as opposed to reliability. That is, in the context of this study Gee's (2011a, b) criteria for establishing validity in discourse will be applied (this is discussed later in the chapter). This study described the identity and practice of individual teachers and as such, there is no guarantee of identical results from other teachers. Limitations specific to this study are discussed in detail in Chapter 8.

An additional limitation is bias. According to Yin (2013), case study researchers may be susceptible to positioning for a preconceived notion since they must understand any issues, such as contrary or competing theories or limitations, before using a case study approach. He suggests a researcher's openness to contrary evidence as a test against bias.

In sum, this section described a multiple case study approach with respect to this study. The characteristics of a qualitative multiple case study are met since the exploration of teacher identity as it relates to practice is an empirical, integrated system, bounded by context, with an emphasis upon participants' views. Using more than one case contributes towards validity (since multiple data sources may converge and could validate results) and a constructivist paradigm (using multiple participants' views appears to indicate the notion of multiple realities since each of their contexts and situations are unique). The strength of using this research approach is its focus upon context, possible application for building theory, and foundation for future studies. However, the limitations include the nature of the case study, the lack of a universal case study approach, the researcher (their ability and biases), and reliability (the potential lack of results that can be identically replicated such as those in quantitative studies).

4.1.3 Inclusion of Participants for this Study

Purposive sampling was used to find biology teachers with professional teaching experience who incorporate the outdoors into their teaching practice. Additionally, purposive sampling provides an opportunity for each participant to contribute unique and rich data (Suen, Huang, & Lee, 2014). This sampling was particularly useful since it allowed for a close match between participants and the main research question. The type of teacher sought was one who taught biology and incorporated the outdoors with their teaching.

When choosing the participants for the study, teachers who had taught biology for a minimum of three years were selected. This amount of teaching experience indicated an experienced teaching identity and practice and a value towards the outdoors, as opposed to novice teachers who are still establishing their teacher identity. The criteria for choosing participants were: a Bachelor of Education degree and certification for teaching; at least three years of professional teaching experience; and included the outdoors with their biology teaching in a meaningful way.

Upon initial sampling, there were six teachers who were deemed a match for this study based upon the above criteria. All participants completed the questionnaire, and both interviews. However, during the early stages of data analysis, it was determined that half of the participants were more closely aligned than the other half. That is, three of the teachers were similar in that they all taught in Alberta public secondary schools, and they taught the same courses such as senior biology and general science. In addition, these similarities also mean that they are subject to similar challenges and obstacles for incorporating the outdoors. In contrast, the remaining teachers differed in significant ways such as in their curriculum objectives, requirements for incorporating the outdoors, and other areas. For example, the participant that differed the most taught a different grade level. The other teachers were both secondary biology teachers but taught different curriculum. Although their data could have provided interesting findings, it was deemed that the differences in grade level, curriculum, and requirements for including outdoor settings would have been challenging in trying to determine any coherences among the participants. Based upon those challenges, the decision was made to focus upon the teachers who were the most similar in terms of curriculum, location, courses taught, and requirements for using outdoor environments.

The participants were current public secondary school biology teachers who were or are in a formal, publicly funded school setting in Alberta. Three participants chosen were (all the names below are pseudonyms to maintain confidentiality and anonymity):

1. Zatanna is a biology teacher who has been teaching for 7 years in the Alberta public school system. Prior to teaching, she worked as a genetics laboratory technician, but she decided to change careers and enter teaching. Since her first year of teaching, she incorporates the outdoors and brings her Grade 11 biology class outside about three to five times per term while her Grade 12 biology class is brought outside about two times per term. Her classes are brought outside to conduct biology investigations.

2. Hal is a biology teacher who has been teaching for 12 years in the Alberta public school system. Upon completion of his first degree, he decided to become a teacher. Since he started teaching, he incorporates the outdoors by taking his biology and general science classes on a full day field trip per semester and doing some outdoor science investigations for each semester.

3. Shiera is a biology teacher who has been teaching for 26 years in the Alberta public school system. Halfway through her undergraduate science degree, she decided to change her program to education. After a few years of teaching, she decided to complete her science degree by distance. Since the start of her teaching career, she incorporates the outdoors. She takes her Grade 11 and 12 biology students outside about 1-2 times per semester to conduct investigations.

These participants present a unique opportunity to compare teachers who were fulfilling the same curriculum requirement in their own way. Zatanna, Hal, and Shiera each described their experiences with the outdoors by fulfilling the Biology 20 field study component of the Alberta curriculum. Each richly described what they saw in terms of academics (student learning, student test scores, being able to connect science to the outdoors) and non-academics (relationship building, valuing and appreciating the outdoors). These teachers are substantive examples because they used the outdoors so that the students were engaged with the environment and were active learners, and they all used the outdoors multiple times for more than field trips.

The intersection of these three teachers was a fascinating area in which to make comparisons and contrasts in terms of their identity (with regard to incorporating the outdoors with their teaching practice), how their identity was represented by their discourse, and how their discussions of their teaching practice showed their value of the outdoors and their identity.

4.1.4 Data Collection

To identify potential case study participants, a questionnaire (Appendix A) was used to determine whether the participant met the requirements for inclusion into the study. There was a total of four questions: whether they had taught or are currently teaching high school biology; their number of years of teaching experience; whether they taught at a publicly funded high school; if they incorporate the outdoors when teaching, and if so, they were asked to additionally provide the number of times they brought students outside and a few examples of their outdoor activities and their rationale for those activities (see Appendix X). The purpose of these questions was to initially find secondary biology teachers who incorporated the outdoors with a mandated provincial curriculum. Since high school students are typically not as exposed to

outdoor learning environments as their younger grade level counterparts (Barker et al., 2002), I wanted to focus upon teachers who provided those opportunities. Those teachers may be considered as atypical and as such they may illuminate the reasons behind the pedagogical decisions of biology teaching. These atypical cases may provide more understanding of teachers' choices of learning environments as opposed to focusing upon typical cases (Stake, 2006). If their responses were deemed as a match for the inclusion requirements (professionally taught biology and incorporated the outdoors with their teaching), then the teacher was invited to participate in an initial interview.

The type of interviews conducted were those commensurate with a qualitative approach, that is, to gain a deeper understanding of the relationship between teacher identity and practice. Within qualitative studies, interviewing is a wonderful means of obtaining data, and its strength is to glean information from those with first-hand experience when the researcher is not present (Myers & Newman, 2007; Stake, 2006). This was particularly important to my study since I was asking participants to describe experiences that I was not able to observe since these were experiences from different times during their teaching career. Because the interview was the main way for me to gather data, preparation prior to conversing with participants was essential. For example, my efforts aligned with the principles of interview preparation as outlined by Turner III (2010): choosing an environment with minimal distraction; explaining the purpose, confidentiality, format, and duration of the interview; sharing the contact information of the researcher; letting participants ask questions at the start; and using a recording device. Using a quiet environment was especially important so that the participants would feel more amenable to sharing more details with their responses (Turner III, 2010).

Providing details in the data contributes towards a rich, thick description, which contributes to describing the context and social and cultural relationships of their experiences (Cohen & Crabtree, 2006). In contrast, Cohen and Crabtree (2006) describe a thin description as a shallow description.

To prepare for the interviews, a pilot interview with two secondary teachers was conducted. This provided an opportunity for me to practice my interviewing and questioning skills so that the flow would be more akin to a conversation. Turner III (2010) supports use of the pilot interview as a means of preparation to improve the design of the interview and to make any revisions.

Prior to the first interview, the questionnaire responses were reviewed and used to generate potential questions (see Appendix X). There was a total of two interviews. For each participant, unique questions were created to allow the teacher to provide further details and to elaborate upon their questionnaire responses (see Appendix X). However, because the interview style is semi-structured, there may have been questions asked outside of what was prepared. Since the questions were specific to each participant and the semi-structured interview allowed for a unique interaction, they also provided ways for the participants' voice to be emphasized.

The first interview was twenty minutes in duration, was recorded using a digital recorder and transcribed by the researcher. The purpose of the first interview was to ensure that the participant used the outdoors in a way where students were engaged and interactive with the environment. S/he was asked to further elaborate on their responses to the questionnaire by further describing the outdoor activities used, and their rationale. The answers to the interview questions (see Appendix H, I, J) were transcribed using a word processing program. If their responses matched the research questions, then s/he was invited to a final interview.

The final interview was forty-five minutes in duration, audio recorded using a digital recorder, and transcribed verbatim using a word processing program by the researcher. The final interview provided most of the data for this study. The research questions were used as a framework for the interview questions (see Appendix X). Because the study sought to examine teachers' discourse as they shared their experiences and practices, questions were open ended and sought to elicit teacher talk about teaching practices and their views of themselves as teachers.

Using the questionnaire and two interviews provided multiple sources of information. According to Yin (2013), using different sources of information is a strength of case study research because this may contribute to converging lines of inquiry or "triangulation." He also adds that those convergences help the case study to be more accurate or valid (validity is discussed further in Chapter 8).

To ensure that participants had a strong understanding of the study and their role within it, they were provided with an information letter that included information about the background, purpose, study procedures, benefits, risk, voluntary participation, confidentiality and anonymity, and contact details to obtain further information. Moreover, a letter of consent was signed to confirm voluntary participation. The biology teachers chose their interview location, such as a classroom after school, their office, and other venues. By choosing a location where they felt relaxed, participants were possibly more forthcoming with their responses. With regard to the interview style, a semi-structured format was chosen so that the appropriate types of questions based on their responses could be asked.

It needs to be emphasized that the procedure described to conduct this study is specific to this study only. That is, there is no universal method to conducting a case study (Yin, 2013). As such, the most I can do is to explain why my study is designed the way that it is. To reiterate, a pilot interview was conducted for me to practice my interviewing and questioning skills. A questionnaire helped in choosing potential participants. The following two qualitative interviews served to successively provide more information and thick description to contextualize and gain further understanding of the study.

4.2 Analysis

After the data had been collected (surveys and interviews--recorded and transcribed), they were analyzed. The analysis took place in two stages. First, each case was examined individually to understand each teachers' identities in relation to the outdoor teaching. That examination was a discourse analysis. Various discourse tools were used to interpret the transcripts to understand identities and relationships with respect to pedagogical use of outdoor settings. Those tools were adapted from Gee (2011b). Then a cross-case analysis was conducted by looking for coherences and contradictions across all three teachers, oriented towards answering research questions 1b by examining the potential of a shared discourse of outdoor science teaching.

4.3 Analytical Framework

This study is about the identities of biology teachers who use the outdoors in their teaching. Identity is internal and unique to each individual, yet also constructed from social interactions. How each person views him/herself and how each person is recognized as being a certain way will vary from individual to individual and from context to context.

Because this study sought a deeper understanding between teacher identity and their practice, the interview focused upon the participants' "best" or "most memorable" moments of incorporating outdoor settings. To try to make the interview process as fluid as possible, I tried to engage the participants in a conversational style interview, so they would be as forthcoming in their dialogue as possible. In other words, data was collected through talk, and one way of analyzing talk is discourse analysis. Discourse is an appropriate method because it emphasizes participants' voices and provides tangible data that can be analyzed. Since there is a reciprocity between language and identity, they are mutually co-constructive (Gee et al., 2001). Although the analysis is limited to participant responses, the analysis included and went beyond language itself. That is, how the responses from the participants exemplify their understandings of biology teaching, how their identity facilitates use of the outdoors, and other areas beyond language revealed from the data.

For this type of analysis, I felt that an adaptation of Gee's (2011b) discourse tools were appropriate. His tools provided a foundation for a deeper picture of identity while accounting for the sociocultural context. Those include ideas from other researchers such as Bakhtin's (1986) theory of heteroglossia; Davies and Harré's (1990) notion of multiple selves; Holland et al.'s (1998) Figured Worlds; Lave and Wenger's (1991) communities of practice, and others. Those other theories guide Gee's (2011b) tools to provide a clearer image of Discourse. In other words, consideration of other types of languages (e.g. a doctor speaking professionally to give medical advice while in other situations s/he may speak as a friend providing personal advice); selves (e.g. the same person may enact a teacher in some situations and a parent in different situations); norms (e.g. what is considered "typical" clothing among gang members may differ from what is "typical" at a private school with a dress code); group membership (e.g. espoused values and

behavior can differ among groups such as those part of a movie club or girl scout members); contribute to a more holistic view of Discourse. It is that more holistic view that this study used to describe biology teachers who incorporate outdoor settings with their practice. That view is meaningful to my study because it helps clarify the way that the outdoors is significant to those teachers. In addition, that view may illuminate the relationship between outdoor environments and science teaching.

4.3.1 Discourse Analysis

In this study, participants were interviewed regarding their identity and practice, and transcriptions of the interview underwent a discourse analysis. The transcripts were analyzed with respect to the language used and how the participants' language reflects identity. Those transcripts were transcribed from speech and as such, I decided where the punctuation was when typing out their responses. Because I am seeking a more holistic description of teacher identity with respect to including the outdoors, the created transcript is considered *broad* since it focused more upon the ideas communicated in their speech as opposed to the inflections or stutters or other physical aspects of their speech (a *narrow* transcript) (Gee, 2011b). Choosing this approach to discourse analysis highlighted the many ways that identity may manifest itself in language (Cohen, 2008). Creating a series of tools, inspired by Gee's toolkit approach, illuminated different aspects of their discourse that contributed to the understanding and interpretation of the participants' identities.

Discourse analysis is wide ranging, it can be approached using a variety of ways, and there is no universal approach towards its analysis (Irwin & Hramiak, 2010; Jorgensen & Philliips, 2002; Rogers, 2011). How a researcher decides to approach discourse analysis will

differ depending on different factors, such as, project, type of data sought, and their own beliefs regarding discourse (Rogers, 2011). Since this study seeks a rich and holistic view of identity, the analysis focused upon the themes and ideas from the participants and how that was enriched by the ways in which they communicated as opposed to technical aspects of language such as grammar. The intention behind that approach is to illuminate the meaning or purpose of a communication based upon the way that language was used (Gee, 2011b). From the communication of my participants, I am seeking to understand their meaning or purpose of integrating outdoor environments with their teaching. In my efforts to gain that understanding, I used discourse and modified Gee's (2011b) discourse tools based upon my data. An adaptation was necessary due to the nature of the data (primarily transcribed from speech) and to focus specifically on the way their identities and practices were created and reflected during the interviews.

Each of the discourse tools examined language in a different way to try to interpret the intent and meaning of the speaker (Gee, 2011a). Gee's "How to do discourse analysis: A toolkit" (2011b) was used as the basis because of its attention to connect discourse with identities and socio-cultural meanings. Using that toolkit as a foundation was fruitful when describing teacher identity because it allowed me to relate to the context to the participants' way of being a teacher. Gee's (2011b) view that the toolkit must be adapted accordingly to each study was applied to this research. While some of his tools attend to larger issues (such as activity systems and figured worlds) grammatical tools are used as Gee's foundation, focusing on technical aspects of language structure. In the early stages of analysis, it became clear that technical distinctions and language use were both difficult to identify in the conversational setting and were not working to build the types of interpretations that were needed to answer my research

questions. While my analysis was not technical in the traditional linguistic sense, I found that using specific aspects of language to support broader views from other tools useful. For the purposes of this research, those tools are referred to as "micro tools" to emphasizes that the focus was on specific wording choices and other speech choices (the following section describes those tools in further detail) but did not adhere to technical distinctions in word types or grammar structures.

As the analysis proceeded, tools were adapted, discarded, combined and remade to be suited for this analysis (for a summary of the tools used see Appendix B). The analysis did maintain, however, Gee's distinction of close-up tools (my microtools were used in place of his grammatical tools) that support larger sociocultural tools. Like Gee, I have called these "discourse tools" but mine have been adapted and modified specifically for this study.

An adaptation of Gee's (2011b) tools are divided in two categories: micro and discourse tools. The micro tools, such as Deixis, Cohesion, Topic Flow or Topic Chaining, and Fill-In emphasized specific wording that contributed to the structure of language. The discourse tools expand on those elements to probe more deeply into the function that language accomplishes for the speaker. These tools include micro tools that show how particular wording is complementary towards discourse analysis (Gee, 2011b). The discourse tools are a way of examining the text in question. However, some tools reveal more information than others as applied to a specific text (Gee, 2011b). To glean the most fruitful data, only those tools deemed to be the most relevant were chosen to study the identities of biology teachers who use the outdoors. This was determined through a review and then a trial and error process. First, a description of each discourse tool was reviewed and those that were most pertinent to answering the research question were flagged. Then, a trial and error process began where the flagged tools were used

to analyze the data. Initial results were scrutinized to determine how well they answered the research question. The tools eliminated were those whose results did not match the research question. For example, the Intertextuality Tool (Gee, 2011b) was initially chosen to discern whether other social languages were alluded to in the communication. After analyzing the transcripts using that tool, it was concluded that intertextuality was not a prominent feature relating to the research constructs and therefore The Intertextuality Tool was not used. This trial and error process continued only until the most useful tools were left. Some tools were eliminated while other tools were combined with one another that resulted in more fruitful data (further discussed later in this chapter). For each case, the results are organized based on the findings emerging from the larger discourse tools. The microtools formed the foundation of the analysis and are used as support for the discourse tool interpretations. Therefore, the results from the micro tools are embedded in the discourse results for each case. A discussion of the applicable tools associated with this study follows.

4.3.2 Micro Tools

4.3.2.1 Micro Tool: Deixis

There are many different ways to examine discourse and different analyses consider different concepts. A common concept of discourse is deixis, which is a linguistic function of deictic elements and a deictic is a special kind of word which is dependent upon context (Gee, 2011b; Norrick, 2001/2003). Gee (2011b) adds that there are three different categories of deictic words: person (I/me, you, he/him, she/her, we/us, they/them), place (here/there, this/that), and time (now/then, yesterday/today, former/latter). Person deictics are special because they reveal who is thought of as a member of a group and who is a non-member, i.e. membership may be

indicated by "we" or "us" while non-members may be referred to as "they" or "them" (Irwin & Hramiak, 2010).

Deictics relate language to context (Gee, 2011b). For example, if I say to you "He's so funny!", I am assuming that you know who I'm talking about. In this case, some kind of prior discussion about a man and his humour are enough of a hint for you to know who I am referring to without naming him. Deictics are used as a relation to context, and to see what assumptions the speaker makes on behalf of the listener and/or what the speaker expects the listener to be able to figure out. The Deixis linguistic micro tool provided a means of relating and clarifying the participants' responses to context. Participants' assumptions partly revealed their background knowledge and values.

The Deixis Micro Tool helped clarify who the teachers considered to be part of the group and outside of the group. Because deictics are specific to the types of words used, it is categorized as a micro tool. This was used as a support in The Connections Building Tool and Figured Worlds Tool to determine connections between groups, and who the teachers typically thought were members of a group.

4.3.2.2 Micro Tool: Cohesion

Cohesion is an important part of texts (Halliday, 1985). It is a set of resources: cohesive devices, relating different parts of a text or speech to one another, and the different ways of accomplishing this are focusing upon specific devices used to relate language (Martin, 2001/2003; Schiffrin, 2001/2003). Within the study of biology teachers who use the outdoors, this tool examined how sentences across texts are united via specific wording (Gee, 2011b). There are six major types of cohesive devices: pronouns (them, I, you); determiners and

quantifiers (most); substitution (done so); ellipsis (when a clause was omitted in such a way where the meaning can be obtained, similar to a blank in a "fill in the blank" type of sentence); lexical cohesion (when lexical items were repeated); words that link topics, adjunctive adverbs (different types of connectors linking clauses in discourse, such as, however) (Gee, 2011b; Halliday, 1985; Martin, 2001/2003). These devices are considered to be a micro tool since the emphasis is upon particular words.

When examining text, connections and disconnections between text must be considered (Gee, 2011b). Cohesion aids in that consideration by acting as a flag to identify when ideas were being connected or distanced from each other. For example, "The principal of the school said that teaching staff are not to bring students off school grounds. However, even though many teachers agreed to do this, the biology teachers continued to bring the students ___." The second sentence will be reviewed for cohesion, it is rewritten vertically, all cohesive devices have an underline:

"However, even though	-	word that indicates that the second sentence relates to the previous sentence
many	-	quantifier, this is a link to the previous sentence and indicates a partial amount of the entirety, "many" of the "teachers" since "teaching staff" was mentioned in the previous sentence and teachers are a part of teaching staff
teachers agreed to do	-	lexical cohesion, "teachers" are lexically related to "teaching staff" since teachers are a part of teaching staff
the	-	determiner, saying "the" biology teachers links to the previous sentence as it specifically indicates the biology teachers who are members of the teaching staff that the principal in the first sentence is talking to, as opposed to a random group of biology teachers
biology teachers	-	lexical cohesion, "biology teachers" relate lexically

	to "teaching staff" since biology teachers are members of the teaching staff
continued to bring the students ___."	- ellipsis, the blank line links and represents information that is predictable based upon information from the previous sentence ("off of school grounds")

The example shows lexical relations to the previous sentence indicating coherence. The Cohesion Tool aids in understanding how ideas are linked to one another. By examining how the participants link their ideas, this helped in comprehending their statements. Greater understanding of participants' statements contributed towards analysis from the other discourse tools.

The Cohesion Micro Tool helped show the way parts of a text were connected to one another. This helped clarify and support how parts of the communication were related to one another.

4.3.2.3 Micro Tool: Topic Flow or Topic Chaining

This tool is related to cohesion in that it examined how topics are linked to one another to contribute towards coherence, as outlined by Gee (2011b). While his analysis emphasizes main and sub clauses and grammar, I interpretively decided the topic(s) and the way they were related. Those decisions were based on what I believed the participant was emphasizing and the way that was accomplished. For example, "I've always enjoyed bringing my students outdoors. They are more enthusiastic and seem renewed after being outside of the classroom. It takes a bit more planning but it's more fun and getting students excited about biology makes it worthwhile." To analyze the paragraph, the sentences are written separately:

1. **I'VE** always enjoyed bringing my STUDENTS OUTDOORS.	- "I' is the theme, in this case, personal teaching experience. The topic is "students outdoors."
2. **THEY** are more ENTHUSIASTIC AND SEEM RENEWED after being outside of the classroom.	- "They" refers back to the students from sentence 1 while "enthusiastic and seem renewed" are the topic.
3. **IT** takes a little bit more planning but **IT'S** more fun and getting STUDENTS EXCITED about biology makes it worthwhile.	- "It" is a substitution but for what, is unclear until "students" are mentioned, so "it" cannot refer to students. The only other thing "it" can refer to is "students' outdoor activities." The topic is "students excited."

Deictics and any cohesion referring to the people involved are indicated by emboldened, capitalized font. While the sentence topics (as interpretively decided by me) are capitalized. The topic chain can be interpretively followed as "students' outdoor activities" <--> enthusiastic and seem renewed" <--> "students excited." These topics refer to bringing students outdoors. Since all the topics are related, the paragraph is coherent in regard to bringing students outdoors. The Topic Flow or Topic Chaining Tool was chosen as part of the analysis to elucidate the logical flow of teachers' statements from the interview transcripts and aided in comprehension of their responses.

The Topic Flow or Topic Chaining Tool clarified the way that topics are related to one another based on the language structure. This tool helped clarify data to support analysis from discourse tools. Since that tool is used as a support for results from other discourse tools, it is part of the micro tools.

4.3.2.4 Micro Tool: The Fill-In Tool

This tool examined the assumptions necessary for communication to have clarity (Gee, 2011b). Gee (2011b) further adds that when trying to understand someone's intention from their speech, we are trying to understand the purpose of their response. The Fill-In Tool provided clarity for that speaker's communication. This tool illuminated intention and further insight towards context of the participants' responses, i.e. intention, purpose, meaning, context. Because the participants are teachers and the researcher used to be a secondary teacher, there may have been moments during the interviews where the assumptions and language used were specific to teachers. When analyzing the transcripts, The Fill-In Tool illuminated and clarified these assumptions and language to demonstrate a language specific to teachers. Also, greater understanding of the context surrounding participants' responses supported results from other tools. This tool is categorized as a micro tool since it was used as a support.

4.3.3 Discourse Tools

While all the tools used in this analysis are part of discourse, the tools in this section differ from micro tools since their results stand apart without solely being used as a support. Thus, the tools in this section demonstrate unique results based upon that tool's purpose. The remainder of this section explains the discourse tools used for the analysis of this study.

4.3.3.1 Discourse Tool: The Significance Building Tool

Significance can be built or removed through language, i.e. words and language structure (Gee, 2011a, 2011b). Gee (2011b) focuses upon main and subordinate clauses to determine significance. Since my data was transcribed from speech and did not contain many complex

sentences examining clauses was not a fruitful endeavor for analysis. Instead I interpreted the main and subordinate ideas based upon the context of the communication. Consider the following example, "Although I may not be the best biology teacher, I always put in my full effort". The main idea is "I always put in my full effort." This is the foregrounded information, what the speaker is making significant. The speaker is emphasizing their effort towards teaching. The subordinate idea , "I may not be the best biology teacher" is backgrounded information, which is less significant. The speaker is trying to minimize their perceived status or ranking as a biology teacher. However, if we reverse the main and subordinate idea, the sentence now reads, "I always put in my full effort although I may not be the best biology teacher". Now, the main idea is "I may not be the best biology teacher," and the subordinate idea, "Although I always put in my full effort." Here, the significance is upon their perceived status or ranking while their effort is backgrounded information. The significance building tool examines what the speaker is trying to make more or less significant, which reveals the values of the speaker. By understanding the values of the speaker, what s/he considers important, this provided insight towards their values conceptual system, and thus their identity.

The Significance Building Tool helped discern what was discursively significant in language through positioning and/or wording. This tool helped show what was being emphasized through language even if it was not directly stated.

4.3.3.2 Discourse Tool: Activities-Identities Building Tool

To discuss participation in a certain type of activity, a certain type of language is used (Gee, 2011a). He also adds that discourse analysis upon that type of language reveals how activities are organized and the Activities Building Tool examined how actions are performed as

98

part of various activities. In subsequent work, Gee (2011b) expanded on this concept in two ways. First, within this context, "action" refers to something currently occurring with the emphasis upon the action. Secondly, actions can be combined according to the rules of a society, institution, or culture, to form an "activity." For example, if someone says, "the biology teacher is reviewing an assignment," this is an action. The verb "reviewing" is currently occurring and it is the focus of the statement and does not have social, institutional or cultural significance. However, if that same person were to say, "the biology teacher is marking an assignment," this is an activity. Although the verb "marking" is currently occurring and is the focus of the statement, it also has institutional (what the school considers to be a passing grade, a failing grade, and others) and cultural significance (how teachers mark and how to assess students), while the word "reviewing" does not. According to Gee (2011b), activities have social, institutional, and cultural significance. Also, when examining activities, it is also important to see its flexibility for it to still be considered that activity since some may have the same, specific pattern without much difference in how those activities are enacted. For instance, if someone asked you to mail a letter, you would have to buy a stamp and drop off the letter at a registered mailbox. There is not much variation when mailing a letter. However, Gee (2011b) adds that some activities have a wider range of variability but can still be identified as the same kind of activity. For an activity to be considered the same as another, there must be some sort of similarity to what happened before or otherwise it would not be recognized as being the same. For example, there are many variations to teaching: teachers may teach using a lecture style, inquiry, and others. These different forms of teaching are similar because they are all recognized as teaching. When analyzing activities, discourse analysis seeks to describe the organization such as the rules, patterns, and values which govern that activity and its associated actions which may be

sanctioned by an institution, culture, or society (Gee, 2011a, 2011b). The Activities Building

Tool is part of the analysis of this study because it helped explain how incorporating the outdoors

is part of teaching.

Another discourse tool is The Identities Building Tool. Language is used to express who

we are; that is, to build identities, since identities are dependent upon context and we interact in

different contexts, we enact different identities (Gee, 2011a, 2011b). For example, a person at

one time, or at the same time, or at different times, can act as a woman, a teacher, and a

department head, amongst other contextually dependent identities, resulting in people having

different relationships in the different cultures, institutions, and social groups in which they

participate. Gee (2011a, 2011b) also adds that to express our participation, we enact a certain

identity that is considered "appropriate" by that culture, institution and social group. There is an

expectation of similarity amongst teacher speech and actions. There are also different types of

teachers: biology teachers, math teachers, drama teachers, and others. However, participation is

not the only way to indicate identity. Gee (2011b) also claims that sometimes, related identities

are needed to indicate another identity. For instance, a biology teacher needs biology students,

and the biology teacher will talk and act towards students in a certain way to construct and

maintain this identity of biology teacher. In addition, he adds that by enacting an identity, we are

socially recognized as being, acting and talking a certain way. Furthermore, discourse analysis

illustrates identities through examining language. The Identities Building Tool examines the

social identity enacted by the speaker or what the speakers wanted others to recognize, how the

speaker's language treated the identities of other people, and how the speaker recognized and

positioned others (Gee, 2011b). The Identities Building Tool is relevant to this study because it

illuminated the teachers' values such as how s/he recognizes her/himself, how s/he wants to be recognized.

The Activities Building Tool was useful in describing specific aspects of teaching practice but seemed limited to that use. Independently, results from The Identities Building Tool focused upon participation and relation to other identities through recognition and enactment. However, results from that tool are limited to context based on other people such as group membership, relations, recognition, and others. When combined, results from those tools went beyond their limitations and illustrated what kind of teacher is associated with particular activities. Those tools work well together because by highlighting the social, institutional, and cultural significance (activity) helps clarify the enactment and/or social recognition of an identity. That combination was fruitful to the context of this study because it contributed to specifying aspects of teacher identity that supported their integration of outdoor environments. The notion that identities and activities are important constructs embedded with one another is supported by Holland et al. (1998) who describes activities as the foundation for people's development and as characterizing members of a social or cultural group. That is, the foundation for identity development and associated characteristics are activities. The Activities and Identities Tools are linked with one another since an activity is recognized as representing the practice of a particular group, that is, a group with a particular identity who is recognized by partaking in specific activities.

4.3.3.3 Discourse Tool: The Connections Building Tool

Language can be used to connect, disconnect, make relevant, and make irrelevant different things (Gee, 2011a, 2011b). For example, if a teacher said, "The students' attitude caused their lack of learning" there is an implication that attitude is related to learning but the specific aspects of that attitude that directly relate to learning is unclear. If the statement changed to "The students' disinterest in chemical reactions caused their lack of learning photosynthesis" this now implies a direct connection between student interest and learning. The Connections Building Tool considers how words and language structure are used to create connections, destroy connections, and impact relevance of things and between things (Gee, 2011b). By understanding how language connects aspects of communication this can aid in describing their conceptual system, value system, and belief system. The Connections Building Tool helped show the way the participants related descriptions of their teaching practice to the way they explained their incorporation of the outdoors. This tool clarified the relationship between their teaching and use of outdoor settings.

4.3.3.4 Discourse Tool: The Social Language Tool and Doing and Not Just Saying Tool and Situated Meaning Tool

The Social Languages Tool has a basis from sociolinguistics regarding how socially situated identities have social languages (Gee, 2011b; Schiffrin, 2001/2003). Each language contains various social languages based upon social (ex. working class English, and more) and/or regional classification (dialects, ex. Quebecois French spoken in Quebec, low German spoken in Ontario, and others) and they indicate understandings and activities representative of social and cultural groups (Gee, 2011b). For a listener to understand what a speaker is saying, Gee (2011b)

requires that the listener must have some indication of who the speaker is. For example, more than just a name is needed to indicate a speaker. The listener needs to know the identity of the speaker such as if s/he talking as a biology teacher, colleague, friend, or other possible identities.

According to Gee (2011b), a social language is a type or combination of languages used to represent a certain social identity. He also adds that to recognize a socially situated identity, one would have to recognize the associated social language, that is, the style of that social language which includes the specific lexical styling of that social language. This styling can be referred to as a *collocational pattern*—a co-occurrence of words that may signal certain social identities and/or activities (Gee, 2011b; Fairclough, 2003). For example, a collocational pattern can signal the speaker as being a biologist, a teacher, or other identities, at a given time and place. Gee (2011b) also explains that through social language and its associated activities, the speaker enacts a particular identity and as a listener, one must recognize the identity and actions enacted by the speaker so that we can figure out the speaker's intentions.

Social languages are distinct forms of language which indicate specific socially situated identities and their associated actions and they may be used one at a time or in combination (Gee, 2011b). For example, if a biology teacher is discussing how to test for water quality by examining certain insects and s/he says something like, "Midges are not the cutest looking insects, but we're going to use them as water quality indicators upstream and downstream from the sewage treatment plant," there is a mixture of social languages. The first half of the sentence "midges are not the cutest looking insects" is lay language, a "casual" type of speaking without "technical" language. The second half of the language, "water quality indicators upstream and downstream from the sewage treatment plant" is more technical. The students must know what "water quality indicators" are to understand that statement. Different languages may be

combined in one or a group of sentences. The Social Languages Tool examines how words and language structure indicate and portray a social language or their combination as representative of a socially situated identity (Gee, 2011b). The Social Languages Tool was chosen because it helped describe what biology teachers believe to be and act upon, their identity. However, results were limited due to the nature of the data, i.e. since all of the participants are biology teachers, they all spoke as that kind of teacher. To enrich results from this tool, it was combined with a couple of other discourse tools.

One of those other tools is The Doing and Not Just Saying Tool which considers language beyond content by also considering deed. Language is more than just conveying information, such as one response may indicate more than one action involved (Gee, 2011b). It is important to keep in mind the contents of a response and what the speaker is trying to accomplish with that response (Gee, 2011b). For example, pretend it is the first day of school and a biology teacher asks the class, "What is biology?" Although the teacher said those words, the teacher is not seeking an answer for him/herself. It is a rhetorical question since the biology teacher should know what biology is. Rather, the teacher wants to know the students' view of biology. The responses from the students may indicate to the teacher how to shift his/her teaching style. From this example, it is not so much what the teacher actually said, but what he/she is trying to achieve through class discussion. The Doing and Not Just Saying Tool was chosen as part of the analysis of biology teachers' identities who use the outdoors because it helped to clarify teachers' practice beyond language.

Another tool was combined with the other two tools. The Situated Meaning Tool has a basis from cognitive psychology specifically regarding how meaning works (Gee, 2011b). Whenever language is used, the meanings expressed are dependent upon context, such as the

same word having different meanings when the context changes (Gee, 2011b; Irwin & Hramiak, 2010). For example, in a situation where we are discussing the landscape of a school grounds and we say, "The school grounds need to be more green," the word "green" means plants, like trees and flowers. In a different situation where a biology teacher is discussing environmental sustainability to his/her class and says: "The school needs to be more green," the word "green" means environmentally friendly, such as by finding different ways for the school to reduce its carbon footprint. According to Gee (2011b) The Situated Meaning Tool considers the context of language and how that context was constructed, when examining the meanings of words and phrases. That consideration is important to this study because clarifying context helps understand the participants' responses, such as what they mean by science teaching and inclusion of outdoor environments. This adds detail to the results and contributes to explaining the relationship between teacher identity and practice.

The Situated Meaning Tool has a close association to the Fill In Tool since assumptions must be made when considering the context of a statement (Gee, 2011b). Two further points are made by Gee in regard to assumptions. Specifically, assumptions are needed since words and phrases which have context-dependent meanings may differ from their dictionary meanings, and also that as listeners, we use context, knowledge and previous experience of the topic to understand the discussion. For instance, if you had never heard about inquiry learning and are unfamiliar with biology teaching, then you cannot situate a meaning for "outdoor education" in a sentence like, "Enhancement of biology teaching methodologies can occur through using outdoor education to complement inquiry learning."

As a speaker, we construct context based upon our knowledge and previous experience of the topic and of the audience, such as whether the audience is knowledgeable or unfamiliar with the topic (Gee, 2011b). From this regard, whenever speakers are discussing a topic, assumptions are made about the audience (Gee, 2011b). For example, how a biology professor may present a topic to a group of colleagues would be different than presenting the same topic to senior high school students. The biology professor would have the assumption that their colleagues would have the necessary background knowledge to understand the topic in detail, for example, all its technical language, methodologies, and related information. That same biology professor, when presenting the same topic to senior high school students, would assume that the students' background knowledge and understanding is at a novice level when compared to university colleagues and would adjust their presentation accordingly, such as using fewer "technical" words in the description and explaining methodologies in more detail. The Situated Meaning Tool helped to describe statement meaning as embedded by context. This tool aided in greater understanding of the teachers' responses from the interviews.

In sum, The Social Languages Tool helped identify characteristics of the language of biology teachers who incorporate the outdoors, which could potentially be a new social language. When combined with the Doing, Not Just Saying Tool, this helped describe the purpose of the social language. The Situated Meaning Tool helped clarify vocabulary within the social language. Since The Social Languages Tool helps identify a social language, its combination with The Doing, Not Just Saying Tool helped determine whether the actions of the language matched what the language was communicating. The Situated Meaning Tool further refined results from The Social Languages Tool by clarifying certain vocabulary within context.

4.3.3.5 Discourse Tool: The Figured Worlds Tool

The Figured Worlds Tool has a basis from psychological anthropology regarding how humans construct meaning to understand one another and the world through language (Gee, 2011b). Figured worlds are constructed socially and culturally where it is populated by certain characters that have certain roles, act in a particular way, have outcomes that are valued in different ways, and have specific motivations (Holland, Lachicotte, & Skinner, 2001). According to Gee (2011b), a figured world is a model, a "standard", and what is construed to be "normal" or "usual" per a specific social or cultural group. With regard to identity, figured worlds provide a basis of who people think they are and how to participate within that particular world (Urrieta, 2007). For example, from Rahm and Moore's (2015) study, the figured worlds of their participants may have facilitated an image of the type of science activity a certain program could offer and acted in a way that was a response to that image. In this study, the teachers' figured worlds portray their understanding of what is typical for their teaching and practice. As explained by Gee, when we think of this "standard," we may think of certain words or stories of what is "appropriate," and different social groups and cultural groups have different concepts of "standard," as such, their stories of what is considered a "standard" also differ. Additionally, these stories may be depicted in metaphor, narrative, and images, and they are figured worlds. Figured worlds are simplified models of specific social, and/or cultural viewpoints of what is considered "typical" or "standard" to understand the world, such as who is a member of this social or cultural group, what actions are "appropriate" and "inappropriate," value systems, and other concepts (Gee, 2011b).

What social and cultural groups consider to be "typical" or "standard" is context dependent (Gee, 2011b). Figured worlds provide that context, such as social relationships, the way that people understand themselves and their behavior, and other typical features (Holland et al., 2001). For example, if I ask you to imagine a typical senior high school science classroom, you will imagine the classroom, its contents, and associations in quite a different way than if I ask you to imagine a typical elementary school classroom.

For a high school classroom, you may imagine:

- A larger-sized classroom

- Contents such as lab benches, fume hoods, desks arranged in pairs, a teacher, and teenagers

- Associations such as teenagers interacting with teachers and each other, the way high school teachers treat their students, the way they teach

For an elementary classroom, you may imagine:

- A room smaller than the high school

- Contents including smaller desks and chairs arranged in small groups, many large and bright, colourful posters in the room, a teacher (more than likely female), small children

- Associations such as the classroom inside a building with other similar classrooms, other small children, other teachers, the building located in a residential area, government funding, young children, the way children treat one another and their teacher, the way an elementary teacher treats their students

According to Gee (2011b), how you imagine these typical classrooms will be based upon your experiences, and different people will imagine typical classrooms differently because they are members of different social and cultural groups and hence, their concept of what is considered to

be "typical" also differs. Concepts of what is "typical" not only change from person to person but also change with time as society and cultures change (Gee, 2011b).

These figured worlds are dependent upon society and culture and those who share membership within those societies and cultures, are familiar with the same figured worlds (Gee, 2011b). He also adds that figured worlds are contained in our perceptions. They are created in our minds, such as some people making these figured worlds direct through books, images, and other media. This aligns with Holland et al. (2001) as they explained figured worlds to coalesce from discourses, activities, artifacts, and performances. Gee (2011b) also claims that when people who are familiar with these figured worlds talk with one another, more assumptions may be made on behalf of the speaker: since s/he knows that the listener knows the figured world, s/he may assume that the listener can fill in the relevant background information and this is associated with the Fill In Tool. The Figured Worlds Tool examines how language assumes what is "typical," such as values, members, activities, stories, images, contents, how the speaker conveys what is "typical", what role the speaker assumes the listener to have, and other characteristics of a specific social and cultural group (Gee, 2011b). The Figured Worlds Tool was chosen because it will help in determining how the participating teachers viewed their use of the outdoors, for example, if it is "standard" or "not standard" towards biology teaching. By explaining how these teachers viewed the outdoors, this contributed towards explaining their identities and practices, such as why they teach the way that they do and the purposes or goals they hope to accomplish.

The Figured Worlds Tool helped identify what the teachers considered to be typical in their teaching practice, such as their understanding of teaching and social relationships within that figured world. By describing what was usual in their teaching, this helped explain the participants' view of teaching, and what teaching is to them.

4.3.1.6 Discourse Tool: The Big "D" Discourse Tool

The Big "D" Discourse Tool has a basis from several different areas, i.e. sociolinguistics, cultural psychology, cultural anthropology, and philosophy, about how meaning transcends thought and language to include technologies, objects, and communities (Gee, 2011b). According to Gee (2008, 2011b) there are two different kinds of discourse: those with a small "d" refer to language, speech or text, as it is in use; while those with a big "D" consider how identity may be recognized through language combined with actions, value systems, objects, and technologies. For example, consider the crowd at a European football (soccer) game. There is specific language (ex. football terminology, names of favoured players, names of the coaches, and other football terminology), specific actions (ex. doing the "wave," singing songs, cheering for your chosen team, and other actions), specific value systems (ex. favouring one team over another, favouring certain tactics, and other values), specific objects (ex. a soccer ball, referees, red and yellow cards, other objects), and specific technologies (ex. ticket authentication, score board, time keeping, and other technologies). This football crowd can be considered as part of a social group, those who enjoy football and support the teams playing. Since big "D" Discourse includes more than just language, while small "d" discourse is limited to language, big "D" Discourse transcends and includes small "d" discourse (Gee, 2008).

These different languages, actions, value systems, objects and technologies help us to coordinate our socially recognizable identities, so we can make sense of our interactions with the world (Gee, 2011b). These identities can be a football fan, a biologist, a teacher, and others. Gee (2001, 2011b) explains that each d/Discourse represents a certain way of being a certain "type of person". For instance, Airey and Linder (2009) consider a discipline's activities and tools, and intricate representations as constituting a "disciplinary discourse." There are different ways of being and different kinds of biologists, teachers, football fans. Being a biology student for instance, is one way to be a particular kind of student but being a biology student is only one kind of student. In other words, a biology student may also have an identity as an English student, if that student is also taking English courses. When we try to make sense of our interactions with other people, we may think of what that person means to us. According to Gee (2011b), whenever people mean anything to each other, language is not enough, and for people to mean something to someone else, they must communicate who they are (socially situated identity) and what they are doing (actions). Gee (2001, 2008, 2011b) also adds that discourses consider how certain ways of being are associated with certain ways of doing, i.e. as a biologist, conducting a field study; as a teacher, teaching a group of students, and other ways of being and doing.

Discourses help people to be recognized in a certain way, doing certain actions (Gee, 2011b). He adds that to recognize something as being a certain way, it must fulfill a set of criteria. For example, something recognized as "biology teaching" (i.e. going outdoors for a nature walk, conducting a field study) may share some features with traditional science teaching (i.e. lecturing, teacher providing instruction) but there may be other features not shared. However, these different ways of biology teaching are dependent upon context, i.e. someone

may recognize these as teaching in one context and not in another. The Big "D" Discourse Tool was used to go beyond language, such as combining the small "d" discourse tool results with values, attitudes, and other characteristics, to explore the participants' way of being a teacher. Big "D" will also be used as a framework to organize the cross-case analysis to elucidate common coherences among the participants (this is discussed in Chapter 8).

4.3.4 Discourse Analysis: Validity

A discourse analysis is about interpreting language so that the full context of its communication may be understood (Gee, 2011a). In arguing for this structured type of discourse analysis, Gee (2011a, 2011b) also suggests four elements that can be used to consider validity. The first element is convergence, which occurs when there is multiple support for an analysis and the more support, the greater the convergence, and the more valid the discourse analysis (Gee, 2011a, 2011b). The second element of validity is agreement such as, if those who speak the social language and members of the d/Discourse under examination agreed with the findings from the analysis, this contributes towards validity. Likewise, if other discourse analysts and other researchers (ex. ethnographic researchers) agree with the results, then the analysis is more valid. The third element of validity is coverage, which means if the analysis can be implemented to other related data, such as: predicting what will happen in related situations and interpreting what occurred prior to and after the situation under analysis. Coverage contributes to the validity of the analysis. The fourth element of validity is linguistic detail, that is, the more the analysis can be related to linguistic structure, the greater the validity. Gee (2011b) goes on to include that each social language has a certain structure which includes grammar, and these structures have certain functions. His example is if the discourse analyst can explain how the findings from the

analysis are related to grammatical devices that contribute to the functions of that social language, then validity is increased.

According to Gee (2011a), if results from the different discourse analysis tools, and linguistic details from the data converged to reinforce the analysis, then that contributed towards validity.

4.3.5 Discourse Analysis: Limitations

This study regarding biology teachers' identities who use the outdoors had one major limitation: the ability of the researcher. This is a common limitation in all kinds of qualitative work. Another common limitation pertinent to a researcher's ability is under analysis, such as taking sides, over- or isolated-quotation, circular identification, and false survey (Rogers, 2011). Although these pitfalls may be understandable to experienced analysts, this may not be enough guidance for novice discourse analysts (Rogers, 2011).

Another limitation of the researcher was the interpretation of the participants' responses and of the transcript. What a speaker actually means is the content of their speech (as recorded by the transcript) and the context in which it was said (this should be captured in field notes during the interview). Since interviews were conducted in a semi-structured style, the interviewer listened to the responses, considered the context, and asked further questions so that the participant may add more detail (Gee, 2011b). This interview style was dependent upon the researcher's ability to respond quickly, and to ask the "right" questions to gain further insight towards the purpose of the study (identity description).

4.4 Researcher's Position

As part of the research design, it is important to consider the author's positionality influencing the study. It is important because a study by Bourke (2014, p. 3) indicates that "positionality represents a space in which objectivism and subjectivism meet" or an individual's position in relation to another (Bourke, 2014, p. 3). This study further cautions that researchers need to be aware of their subjectivities such as acknowledging their social position both as individual and members of various groups. The remainder of this section will explore my own positionality across several areas with respect to my study.

Since the design, collection, and analysis of this research investigation was conducted by the author, my positionality is implicit throughout this study. According to Savin-Badem and Major (2013) a compelling positionality declaration includes:

> researcher's lenses (i.e. their philosophical, personal, theoretical beliefs and perspective through which they view the research process), their potential influences on the research (e.g. political beliefs, social class), the researcher's chosen or pre-determined position in relation to the participants (e.g. as an insider or an outsider…) their context and an understanding/explanation as to how, where and when and in what way the researcher may have influenced the research process (p.75).

That view of positionality is complementary to Glesne (2011), who described awareness of positionality as awareness to the research content, process, and interpretations. Awareness must be addressed since the researcher is responsible for data collection in qualitative research (Bourke, 2014). As a researcher, my lenses are of a qualitative approach with a constructivist paradigm. In other words, my emphasis is to gain a deeper understanding of the relationship between identity and practice, such as incorporating outdoor learning settings. With regard to data collection, this means that I ground my data in context and try to obtain information from the view of the participants in as much detail as possible. The corollary is that my data

interpretations focus upon participants' perspectives to highlight their voices. However, I am also influenced by my past experiences. The remainder of this section addresses each of these different areas to address the positionality of the author.

Because I was a former high school biology teacher who would incorporate the outdoors with my three years of teaching, I have first-hand experience of the challenges and benefits that outdoor learning has for teachers and students. During my teaching, I tried to include outdoor settings as much as possible, such as in different units, and in different courses I taught other than biology, such as Grade 10 General Science. In addition, my views on the way students learn science, and the ways that science may be taught, are affected by the courses and experiences I have had at the University of Alberta. Prior to teaching, I enjoyed my limited experiences learning science outdoors. I acknowledge that my relationship with my research, my support for using outdoor environments, and my understanding of how students learn science temper this research investigation. These sentiments align with Bourke (2014) who describes the researcher's voice and positionality as embedded within the research project, and his/her reflections influenced by the research process including participants.

With regard to perspective and position, within this research investigation, I was the principal investigator responsible for the design, dissemination, and collection of the questionnaire, interviews, and analysis. Due to these roles, especially collection and analysis, Bourke's research (2014) asserts that the subjectivity of the researcher will affect the study including reporting of results, i.e. voice. In addition, this research asserts that the researcher's interpretation of the participants' experiences is another example of subjectivity. From my own experiences as an outdoor science educator and researcher, my interpretation of the participants' experiences is pedagogically mindful yet simultaneously trying to get as much detail as possible.

This is significant to qualitative research to obtain thick, rich description and to engage the participants in dialogue that co-constructs their identity as a biology teacher who includes outdoor settings with their teaching.

In terms of research objectivity, to the participating teachers, I was the researcher as a doctoral student. Research objectivity may be complex since the participants were familiar with the doctoral supervisor at the time, and a previous relationship was held with Shiera (we were in the same graduate class).

Moreover, the interview questions and flow of the semi-structured interviews were guided by my professional history and research perspective and this was where my bias was most influential. This aligns with Bourke's (2014) view that the relation between the researcher as research instrument and participant(s) is symbolic of the persuasiveness of the research process. Due to the nature of the interview method, I as the investigator lead the interview in a way where my biases are implicit in the types of questions I ask, the order of the questions, and in the manner that I ask questions. That is, my interactions with participants were grounded in my lived experiences as a former secondary school biology teacher who incorporated the outdoors. However, the interview method is multi-directional since its continuance is dependent upon the interview-interviewee interaction. For instance, Akkerman and Meijer's (2011) study concerning dialogue as a way of understanding teacher identity describes participants as responding in a way where they try to anticipate the interviewer's needs, such as providing desirable responses. Furthermore, they also describe participants as acknowledging the listener, which may include revealing the way that they understand and view themselves, and talking in a particular manner, such as using more academic vocabulary. Their study shows the co-constructive nature of the interview process, that is, where both interviewer and interviewee

simultaneously "create" one another. From this perspective, each interview is unique due to the investigator-participant relationship. The corollary is that no interview can be exactly replicated.

While in dialogue with the participants, the interview method is interactive and unique. In other words, it is multi-directional since its continuance is dependent upon the interview-interviewee interaction. As an interviewer, my goal was to try to get the participants to explain their pedagogical decisions behind why they chose to incorporate the outdoors. In terms of asking questions, that may mean re-wording, and/or requesting elaboration on their responses. Akkerman and Meijer's (2011) study concerning dialogue as a way of understanding teacher identity describes participants as responding in a way where they try to anticipate the interviewer's needs, such as providing desirable responses. Furthermore, they also describe participants as acknowledging the listener. That may include revealing the way that they understand and view themselves, and talking in a particular manner, such as using more academic vocabulary. Their study shows the co-constructive nature of the interview process, that is, where both interviewer and interviewee simultaneously "create" one another. From this perspective, each interview is unique due to the investigator-participant relationship. As an example, my participants may try to phrase their responses in a way so that it aligns with what I am looking for. I had disclosed to them that I was a former secondary biology teacher who is inclusive of the outdoors. This may influence them to emphasize the way they specifically incorporated natural settings with the content they were teaching, and the ways that they determined its effectiveness upon students, such as the way students reacted while outdoors and their performance on assessments based on those experiences. Yet, if I had not disclosed that information about myself or if I had never taught before, their responses may shift to a direction

where a "non-teacher" would be able to understand their experiences. Due to my relationship with the participants, the corollary is that no interview can be exactly replicated.

4.5 Summary

The research methods and analysis methods presented in this chapter demonstrated my approach to gain further understanding of the relationship between teacher identity and including outdoor learning environments. This study sought to provide a rich, thick description of the relationship between identity and practice of biology secondary educators whose discourses portray that bringing their students outside of the classroom is important to their practice. This was achieved using a qualitative multiple case study approach where each teacher was treated as a separate case to emphasize their individuality. To find any coherences among the participants, a cross-case analysis was conducted. To highlight the participants' voices when describing their identity and practice, discourse analysis was used.

The following three chapters present the results of this dissertation. The findings of each case study are presented in Chapters 5, 6, and 7, respectively.

Chapter 5

Case: Zatanna

Zatanna taught for seven years at publicly funded high schools and incorporated the outdoors with her high school biology classes (course codes Biology 20 and Biology 30). She would bring the Biology 20 class outside about three to five times per term, and the Biology 30 class approximately two times per term. She has a Bachelor of Science degree and worked as a technician at a genetics laboratory prior to teaching.

5.1 The Significance Building Tool

The Significance Building Tool shows what is important and unimportant in communication. Importance is interpretively based on whether the information is foregrounded or backgrounded. Using Gee (2011b) as a foundation, if the information is foregrounded it is the main topic and therefore significant; backgrounded information is viewed as less significant. The Significance Building Tool shows the areas that Zatanna considered significant to her teaching practice: valuing student learning and valuing mutual respect. The rest of this section examines these results.

Zatanna's language shows that she valued student learning by making the following significant from her description of her practice: testing new activities and using known effective activities. Both areas demonstrate a possible value for student learning since it is only students who would benefit from either action. If a teacher did not care about student learning, then the effectiveness of an activity would not be tested nor used for its potential to help students.

The Significance Building Tool highlights what Zatanna considers significant in her teaching by focusing on main topics and the use of lexical cohesion. Examining the main topics

requires reorganizing her descriptions line by line and indicating the foregrounded information (areas of significance) with an underline:

Example 1

1. <u>I switch every year</u>, what I do.
2. Not all the time, like <u>I keep the things that work</u> but, I don't care but, like, <u>I'll try a bunch of new things</u>, I'll take things out if I don't like it.
3. <u>I don't mind putting in the work</u>, I guess, year to year?
4. To change it so that it's not, like I mean, <u>if something's not working why would I do it again?</u>
5. But <u>I know people who do</u>.
6. Well partially, I don't wanna be bored but, more that like I don't think just because something works doesn't mean that there's not <u>something better</u>, I guess.
7. So, why wouldn't you try <u>something else that might work better</u>?

The underlined information suggests what Zatanna considers significant: changing what she does each year, keeping what works, trying new things, does not mind putting in the work, not re-using things that do not work, knowing people who use activities that do not work, and looking for something better (than what she has). I interpretively determined what was significant by considering the objective of each sentence. For example, the significance of Zatanna's communication is revealed in the first sentence (Example 1) when she says "I switch every year". Since that is the significance of her sentence, support for that purpose was examined and if found (via interpretation), then it was underlined because this evidence reifies the significance of her communication.

In addition to the foregrounded information, repetition in Zatanna's statements is significant because it adds further importance to the communication (Gee, 2011b). From The Cohesion Tool, areas of repetition are referred to as being 'lexically cohesive,' and "a replication of words that are related to each other" (Gee, 2011b, p.130). For example, lines 1 and 2 are lexically cohesive because "I switch every year" (line 1), and "I'll try a bunch of new things" in

120

(line 2), both communicate that Zatanna changes activities. Another example of lexical cohesion is found in lines 2 and 4, "I keep the things that work" (line 2) and "if something's not working why would I do it again" (line 4), that both express Zatanna's interest in an activity is based upon its effectiveness. A third lexical cohesion occurs on lines 6 and 7, when she says, "something better" and then "something else that might work better." By expressing the same sentiment multiple times, these lexically cohesive phrases show that Zatanna emphasizes that there might be an activity that could be better than the activity she is currently using. Rewriting the significant areas of Zatanna's responses shows how significance and lexical cohesion complement one another,

> Every year I try a bunch of new teaching activities. I do not mind putting in the work. I will try a bunch of new things and only keep the ones that work. I do not want to repeat activities which do not work, and I want to find better activities than what I have.

This rewrite removes the backgrounded information, making it easier to see that Zatanna emphasizes testing the effectiveness of an activity. The Significance Building Tool reveals that the significant parts of Zatanna's practice are trying new teaching activities every year in the hopes that one or more of them may be better than her current activities, and that she does not mind the effort involved in trying those new teaching activities. Based upon these areas of significance, it seems that Zatanna views herself as using effective teaching activities to teach science and looking for better activities each year.

Another area that Zatanna makes significant in her description is the use of effective activities (activities that Zatanna has already tested and deemed to be effective). The Significance Building Tool reveals that using known effective activities such as practical applications (labs) and the frequency with which Zatanna uses them in all her classes (special education and academic courses) are significant to Zatanna's description of her teaching practice.

When she describes her use of practical applications, The Significance Building Tool emphasizes the benefits of using labs for her classes.

The significant benefits from Zatanna's special education class are also indicated through the use of main topics, lexical cohesion, and emphasis. When the researcher asks Zatanna what changes she noticed from the students after using hands-on activities, she responds:

Example 2

1. They were *all* great because they can use them as examples.
2. So, it helps them to remember things they wouldn't, they wouldn't have just by reading.
3. So, they can translate this activity to this concept.

Since each sentence is short, determining clausesdid not necessarily provide useful distinctions of significance. Instead, I interpreted the purpose of each sentence as what Zatanna appeared to be making significant. In addition, Zatanna uses lexical cohesion and emphasis to add further significance to how lab activities helped special education students understand science concepts. For instance, each sentence echoes the cognitive benefits of lab activities. The sentences describe three different benefits: labs can be used as examples (possibly to understand concepts) (line 1), labs can help students remember science concepts in a way that is more effective than reading (line 2), and labs can relate the activity to the concept (line 3). If Zatanna did not echo the cognitive benefits of lab activities upon the students, her statement could have been:

They were *all* great because they can use them to help understand science concepts.
The rewrite above is different from Zatanna's original statement because details are limited to how the labs helped students understand science concepts. The multiple phrasings of the cognitive benefits of lab activities in the original statement adds further importance to the different ways labs are beneficial to student learning. The Significance Building Tool reveals

122

that through main topics, lexical cohesion, and emphasis, Zatanna's description of using labs

focuses on how these activities helped special education students understand science.

The Significance Building Tool suggests similar results when applied to Zatanna's

descriptions of her academic students. For instance, when Zatanna discusses how labs helped

her academic students, she does so in the following manner (main topics indicated by an

underline):

> Example 3
> (Researcher asked Zatanna what changes she had noticed from students after using labs, ex. better test scores.)
>
> 1. Definitely in the um, the ecosystems unit and their biosphere unit but less so in the human biology because there's not as many hands-on labs that you can do.
> 2. Or the labs that you are doing are not necessarily, I mean they may be models for something but they're not mimicking a real-life situation, whereas the other ones do.
> 3. So that I think if the lab can mimic as much as possible a real-life scenario, that, is where I saw improvement.

The main topics (underlined above) were interpretively determined based on the purpose of each

sentence and those reveal the areas that Zatanna makes significant. These significant areas

demonstrate what kind of improvement she saw from students, such as better test scores, the

units where improvement was best seen (ecosystems unit and biosphere unit) and not seen

(human biology unit), and what design of lab activity gets the most improvement from students

(labs that closely mimic a real-life situation). Another way of examining the main topics is to re-

write her statement so that only the significant areas are included:

> I definitely saw improved test scores from the ecosystems unit and biosphere unit, less from the human biology unit, and academic improvement from labs which closely mimicked a real-life scenario.

In addition to the main topics from her description, the use of emphatic words adds further

importance to the labs. When the researcher asks Zatanna if the helpfulness of the labs translated

into academic performance, she responds "Definitely in the um, the ecosystems unit and their

biosphere unit. The emphasis "definitely," adds further significance to how the labs help with academic student understanding of science.

The Significance Building Tool illuminates the extent to which Zatanna's main topics, lexical cohesion and emphasis suggest the significance of using labs in her practice. When Zatanna describes the number of times she used labs, she does so in the following way (main topics underlined):

Example 4

1. So, we did <u>labs almost every day</u>.
2. Like a <u>crazy number of labs</u> and then they had, like they had movie Fridays.
3. I mean, we had to, cuz it was just like <u>they just couldn't go five days</u>, it was just too much.
4. So any 5-day week they had <u>movie Friday</u> that they could pick any movie they wanted as long as they could convince me that there was a science concept in the video.
5. But it was, I mean, they were picking like, so we watched Jurassic Park because that could be <u>genetics</u>.
6. And we watched Fast and the Furious because that's <u>energy transfer and safety</u> because in the, in the Grade 11 class they have um, transportation safety.
7. So then we talked about why they were bad in Fast and the Furious for <u>not wearing seatbelts</u> and just things like that.
8. So I mean, as long as they were like, <u>you have something every day, they were ok</u>.
9. I did even <u>more labs</u>.
10. Cuz I do labs with them <u>*all the time*, like all the time.</u>
11. And so I think that hands on thing transferred into my other classes, not that, I was doing quite a bit of labs anyways, but then, <u>even more</u>.

The main topics were interpreted as the areas that supported the objective of her communication. The lexical cohesion can be classified into three overall areas: the amount and frequency of labs (lines 1-2, 9-11), and limitations of the frequency of labs (lines 3-7). When Zatanna describes the frequency of labs, is the significant phrases are "labs almost every day" (Line 3), and "*all the time*, like all the time" (line 10). The way that she describes the frequency is unspecific, perhaps suggesting that a quantified amount would not accurately convey the regularity of labs. If she

had said that the class did twenty or thirty labs, it would not sound as impactful as saying

"almost every day" or "all the time." Instead of using an exact count, she uses emphasis to add

further importance to her assertion. The phrase "almost every day" makes her assertion more

important and this was supported by the repetition "*all the time*, like all the time" (line 10). By

repeating "all the time," Zatanna further emphasizes how often labs were done, which is

supported by the number of lab activities she used. When describing the number of labs, she

uses emphasis by saying "crazy number" (line 4), "more labs" (line 11), and "even more" (line

11). Through main topics, lexical cohesion, repetition, and emphasis, The Significance Building

Tool reveals that the number of labs and the frequency with which Zatanna used lab activities

were significant to her teaching practice.

Another significant area is her value for mutual respect as represented by the way she

describes the rules in her class and the privileges she gives to her students. Zatanna describes her

class rules in the following manner (areas of importance indicated with an underline):

Example 5

1. I <u>don't have</u> any.
2. That's what I say. [Laughs]
3. Like on my course outline, they have the rules, <u>1. respect</u>, that's exactly, that's all it says.
4. And then I say, you know, I just <u>explain</u> to them, it's like, if I, I'll tell you what I do and then you have to <u>mimic</u> that because that's just <u>appropriate behaviour</u>, so if I drink a coffee, I'm gonna make sure I throw it in the garbage, if I'm gonna eat something, there's no crumbs.

There are several areas that Zatanna makes significant (those areas are interpreted as the purpose

of each sentence), as seen in the underlines above. With these main topics, Zatanna shows and

explains what she meant by her rule of respect for her class. Rewriting the main topics provides

the following statement:

I do not have any other rules in my course except for respect. When I explain this rule, I tell my students that they must mimic my actions for appropriate behavior.

125

From the rewrite, it is clear to see that Zatanna's interpretation of respect is when teachers and students are allowed the same privileges in class. The way that Zatanna ensures the same privileges is to use herself as a role model, ex. she only does things in class that students can do.

Another way that Zatanna's language shows value for mutual respect is in the descriptions of the privileges she allows students. For instance, Zatanna describes the privilege of letting students eat in class (main topics underlined):

Example 6

1. I think the best thing that I do is that I never [sighs] I don't know how to explain this but, I <u>never expect something different</u> from the students than I would expect of myself.
2. So in both, like I would <u>*never* do something that I don't let my students do in class</u>, ever...
3. For me, it's something simple like, I <u>like to have an apple</u> every morning at 10.
4. So I <u>let the students eat</u> in my classroom.
5. So whyyyy, if I can eat there, <u>why can't they</u>, if they're putting their garbage away like I put my garbage away?
6. So it's kind of like <u>two sides of the coin</u>, right?
7. So I'm allowed to eat, which is a privilege, so are they, which is a privilege, but I <u>always throw my garbage away</u>.
8. And so, <u>they have to throw their garbage away</u> to have the privilege.
9. So it's kind of, that and they, <u>they get that</u>, right?
10. Like, <u>kids aren't stupid</u>, right?
11. And I, I don't know.
12. I think they, what, makes it ok for them to come in and for them to be able to ask anything is the fact that they knooow, that I'm not gonna make fun of them because, or think anything less of them or, because if I do the same thing, I would want them to respond in the same way?
13. So I think that they get the mutuality, of the relationship?
14. Versus, 'I'm the teacher, you're the student'.
15. So, I think in that sense they're comfortable knowing that I'm not making up these crazy rules for some crazy say for that I think that, 'You're students so you can't eat in the classroom' or 'You can't have a coffee'.
16. It's like, 'I'm drinking a coffee, of course you can', like why especially because they're in high school, like they're high school students.
17. They're going to be adults, some of them are adults, some of them are 19, like whyyyy would I dictate what they can do and not do in that respect and so, I don't

know, I think there's a mutual respect that I think makes them feel comfortable saying and doing things and coming into class, and you know, they're not worried about the fact that they're hungry because they can just eat and then deal with the biology, right?

18. Like that's not, thinking about those kinds of stupid things to me, those administrative pieces of somebody, like, as a person isn't there, right?
19. So they can just sort of focus on the biology because they don't have to worry about, those other things.

There are several areas of importance as indicated from the main topics (underlined) including the following: never expect something different, never do something different that I don't let my students do in class, like to have an apple, let the students eat, why can't they, two sides of the coin, always throw my garbage away, they must throw their garbage away, they get that, kids aren't stupid. To interpret those significant areas, they were considered synonymous with the objective of her communication. A majority of these main topics are lexically cohesive, including equal privileges between Zatanna and her students (lines 1-10), which is expressed in several ways. Lines 1 and 2 convey that she does not expect and does not do something different from what her students are allowed to do in class. She explained that as long as students mimicked her behavior, including throwing their garbage away just like Zatanna does (lines 7-8), then there is no reason to deny them equal privileges (line 5). The degree to which Zatanna holds this belief is evident through her use of the word "never."

Overall, The Significance Building Tool reveals through Zatanna's main topics, lexical cohesion, and emphasis that she significantly values student learning and mutual respect in her teaching practice. Her descriptions of testing new activities and using known effective activities shows that she significantly values student learning, and the emphasis she uses when recounting her frequency of lab use suggests her desire to use effective activities as much as possible. Furthermore, the Significance Tool also indicates her value for mutual respect. When she explains her class rule, the main topics indicate that she holds herself accountable to the same

rules as the students, and that she allows them the same privileges. Lexical cohesion suggests that she allows her students to have the same privileges as her, and her use of emphasis demonstrates that she does not expect her students to act differently from the way she acts.

5.2 The Activities - Identities Building Tool

The Activities Building Tool demonstrates how someone is socially recognized by the activities she or he partakes in. With this discourse tool, activities are analyzed as combined actions according to the rules of a society, institution, or culture (Gee, 2011b). He adds that from a discourse analysis perspective, it is important to consider how an activity is organized by various factors, including governance (rules, patterns, and values), and associated actions (as normalized by an institution, culture, or society). Despite this organization, the way individuals carry out an activity may vary since some activities are more routinized than others, and some participants attempt to realize their own goals within that activity (Gee, 2011b). For instance, within my study, each of the biology teachers participated in the activity of teaching, specifically including the outdoors in their teaching practices. Although their teaching is organized by the same curriculum and school rules, the way that each teacher includes the outdoors is unique. When The Activities Building Tool analyzes individual transcripts, initial results are shallow (due to the context of the interview), focusing only on surface language without reflecting how discourse represents identities and practices with respect to including the outdoors. However, when The Activities Building Tool is combined with The Identities Building Tool, more meaningful results are obtained.

The Identities Building Tool examines three elements: the social identity enacted by the speaker, (what the speaker wants others to recognize), how the speaker's language treats the

identities of other people, and how the speaker recognizes and positions others (Gee, 2011b).

Identities depend on context and since individuals interact in different contexts they enact

different identities (Gee, 2011a, 2011b). By enacting an identity, people are socially recognized

as being, acting and talking a certain way (Akkerman & Meijer, 2011; Gee, 2011b; Sachs, 2001).

For instance, Gee (2011b) explains that sometimes, an identity is enacted through comparison

(ex. similarities between science teachers), contrast (ex. how one science teacher may differ from

other science teachers), and relation (ex. to be recognized as a science teacher there may be

science students, a science classroom with scientific equipment, and other items that may be

associated with being recognized as a science teacher). Initial results from the interview data

were limited and did not go beyond the social recognition of a teacher. Through a combination

of The Activities Building Tool and The Identities Building tool, hence The Activities –

Identities Building Tool, Zatanna recognizes herself as the kind of teacher who demonstrates

responsibility for her teacher duties and values student learning. This was evident from her

description of the first time she brought students outdoors. For instance, because Zatanna claims

that all Biology 20 teachers should bring their students outdoors since it is part of the curriculum,

this suggests that she views the curriculum as mandatory. Additionally, this claim positions the

listener to recognize that all teachers should follow the curriculum. This was demonstrated in

several ways from the following description,

> Example 7
>
> 1.   In Bio 20 you have to [incorporate the outdoors].
> 2.   There's a field study component so, according to the Program of Studies you're
>   supposed to.
> 3.   So everybody, every single teacher in Bio 20 should be going outside but that is not
>   always the case, I know that's true.
> 4.   But when I first started teaching, I was teaching at a rural school and I was the only
>   one there.
> 5.   And so I'm like checking off the Program of Studies boxes, right?

6. So I'm like, "aw, field study, this sucks, I gotta go outside" and I didn't time it very well.
7. And so, it was winter and so I was like, "aw man, what am I gonna do?"
8. So the old principal who had seen me in my student teaching and had gotten me the job there, he was a total outdoors guy.
9. So he came in, volunteered, as a parent volunteer which has no kids but, whatever.
10. And drove a bus, so he rented a bus for us for free, so that was good.
11. And took us outside and so we kind of came up with the plan ourselves but we went on a winter field study.
12. And we actually went on the ice with the bus, which I'd never do now but, ya like at the time, right?
13. You're sort of like, "well, he knows what he's doing," right?
14. And so, we went out onto the ice, we drilled holes, we took water samples, they did ecosystem field study, I guess.
15. Throughout the whole thing we went to 3 different lakes that were in the area and did a comparison study as part of their field study.
16. And so after that, I think I was like, "aw, winter field study is so cool."
17. And so that's what I do with my Bio 20s as much as possible as a winter field study.
18. Going out that first time, I think motivated me to keep wanting to go outside cuz the kids love going outside, much more so than sitting in a classroom.
19. And it's biology so you think, "if you're gonna teach about the outdoors, you might as well be outdoors."

At the beginning of her description, Zatanna makes it clear that incorporating the outdoors with biology is a curricular requirement that all Biology 20 teachers should fulfill (lines 1-5). She uses lexical cohesion to emphasize that incorporating the outdoors is mandatory since it is part of the curriculum. This is supported by the following examples from her description: you have to (Example 7, line 1); according to the Program of Studies you're supposed to (Example 7, line 2); so everybody, every single teacher in Bio 20 should be going outside (Example 7, line 3). If instead of this firmness, Zatanna's language contained hedging, such as "you could," or "you might," instead of "you have to," and "you're supposed to," her view would seem quite different. Instead, her language is specific and firm that the activity of teaching requires fulfillment of curriculum. Zatanna's sense of responsibility is reified in the next few lines (4-6): by "checking off the Program of Studies boxes," Zatanna shows that she is the kind of teacher who fulfills teacher duties, such as keeping track of fulfilling curriculum requirements. Impressively, the

phrase "I gotta go outside" shows no hesitation about meeting those requirements despite the winter weather. This sense of responsibility is further strengthened with Zatanna's use of identity contrast. For example, in line 3 she says she knows that not all Biology 20 teachers bring their class outdoors (despite the curriculum), and this contrasts with her own strong sense of responsibility.

Results from Zatanna's discourse show that in addition to fulfilling her teacher duties, she values student learning through recognizing student reactions, and using the winter outdoors as a viable learning environment for biology. When Zatanna describes student reactions from the winter field study, she wants the listener to recognize that students prefer being outdoors than indoors (example 7, line 15) and that their reactions were the source of her motivation to continue incorporating the outdoors. Another way that this example demonstrated a value for student learning was by relating her motivation to continue incorporating the outdoors with student excitement while learning. This suggests that she views herself as the kind of science teacher who wants their students to be excited while learning (otherwise she may not have acknowledged student reactions).

Another example of Zatanna's discourse showing a value for student learning is her desire for the listener to recognize winter as a viable learning environment for biology. When the researcher remarks surprise about going outside during the winter because most people say that going out in the winter is such an obstacle, she replies:

Example 8

1. It was so positive, like so positive.
2. I always go outside.
3. The kids hate it, so they say.
4. But then they don't, right?
5. They actually have fun.

131

6. We've been out in blizzards, it was literally a blizzard, the buses weren't running but this was our field study so they all came.
7. We were like, outside, it was so cold, so horrible, like so we thought.
8. But it was actually a ton of fun for the kids, they really liked it.
9. And if you talk to [name of a leading national textbook author and curriculum consultant] at all, he's very much a proponent of winter as like an outdoor learning place for biology.
10. So we've had lots of conversations about that, too.
11. That's my preferential time to go.
12. Winter specifically.
13. I prefer winter.
14. I think the kids don't go outside for winter and if they do, it's for sport and not, they don't necessarily understand that things are still happening in the winter. Right?
15. Like, they have this idea that winter means everything is sleeping or dead, right?
16. It's not.
17. So it's a good place for them to go and actually see like, "oh hey, guess what? Things still have to live out there. Weird."

There are several areas in this description that Zatanna wants the listener to recognize. One area

is that the winter field study is a chance for students to alter their view of winter ecosystems

(example 8, lines 11-17). The way that Zatanna's language demonstrated this altered view is to

relate a winter activity (ex. sports) with students (line 14). Furthermore, this relation

demonstrates a lack of relating winter with biology and positions the students as playing in the

winter outdoors as opposed to understanding winter ecosystems (lines 15-17). Because she

wants the winter field study to be recognized as a way of helping students understand science,

this field study was used more as a science activity than an outdoors activity. She also wants the

listener to recognize that students enjoy the winter field study despite their initial complaints

(example 8, lines 3-8), demonstrating that she cares about student reactions. Since the students

reacted positively, this may have contributed towards her positive attitude regarding the winter

field study (example 8, line 1). This is emphasized through repetition of the word "positive" in

this same line, and in line 2. Together, these first two lines indicate that she wants to have

another positive experience. Another area that she wants recognized is the third-party support

for the winter outdoors. For example, she mentions that a leading national textbook author and

curriculum consultant was supportive of the winter outdoors as a learning place for biology. By citing a third-party support, there is more credibility for incorporating the winter outdoors. This is also an example of Zatanna's language using comparison to align her views with a third party so that her use of the winter outdoors seems "validated." These different examples, incorporating support by a third party, repeating that this is a positive experience that students enjoy, and a chance for them to change their perception about winter ecosystems, represent how Zatanna's discourse wants the listener to recognize winter as a viable learning environment for biology.

In sum, The Activities - Identities Tool show that Zatanna is the kind of teacher who is responsible with her teaching duties and who values student learning. For Zatanna, the activity of science teaching includes a few key areas that may differ from other science teachers. For instance, Zatanna considers the curriculum as mandatory and this contrasts with some of her colleagues. She also considers student reactions when making decisions on her teaching practice, ex. whether to continue using outdoor activities based on student enjoyment. It is because of their reactions that Zatanna continues to include a winter field study when teaching Biology 20. Together, these examples demonstrate that Zatanna's view of the activity of science teaching is to always fulfill the curriculum in a way that ensures the students enjoy what they are learning. However, in conjunction with The Identities Building Tool, Zatanna is the kind of teacher who is independent and confident with the way that she teaches (otherwise she may feel influenced to teach like her colleagues, ex. not to teach the whole curriculum). Additionally, The Identities Building Tool also shows that she values student voice. Because she considers student reactions when making decisions about her teaching practice, ex. whether students react positively, one of her teaching goals may be for students to enjoy their learning experience. For example, because

students enjoy the winter field study she continues to include this in her teaching. From the combination of The Activities and The Identities Building Tool, Zatanna is revealed as the kind of teacher who values student voice as a way of fulfilling her teacher duties, i.e. although she is committed to fulfilling the curriculum, she does so in a way that is tempered by student voice.

5.3 The Connections Building Tool

The Connections Building Tool shows the ways that language can be used to connect, disconnect, make relevant, and irrelevant different pieces of information (Gee, 2011a, 2011b). Speakers may choose their words and phrasing to sway the listener towards a particular view (Gee, 2011b). He also adds that occasionally, the speaker assumes that the listener will fill in any missing information--in this situation, the Fill In Tool is needed. Furthermore, he explains that the Fill In Tool adds clarity by examining the assumptions made in a communication. Also, according to Gee (2011b) both tools can complement one another by showing the words and grammar used to create and destroy connections, and the relevance of information and between information. This section uses The Connections Building Tool to analyze Zatanna's descriptions of incorporating the outdoors with her teaching. Findings indicate that she connects the outdoors in many different areas, ex. curriculum, planning outdoor activities, effects on her relationship with students, students' renewed interest in learning, and teaching and experiencing about the outdoors.

Zatanna connects the outdoors with curriculum by using field study as a requirement, field study during the winter, and field study as a student preference for learning environment. Assumptions (as revealed by The Fill-In Tool) and repetition connect the outdoors with curriculum. Zatanna relates incorporating the outdoors with curriculum by making the following

connections: field study → you have to + supposed to + Biology 20 + Program of Studies + each teacher should go outside (Example 7 lines 1-6). The phrases that Zatanna connects to field study seem to convey a sense of necessity that may indicate that she views the field study as mandatory when teaching Biology 20. The connections also indicate that all Biology 20 teachers should incorporate the outdoors and is supported through repetition of "supposed to" and "Biology 20 Program of Studies" (both repeated twice). Zatanna's language seems to indicate that all teachers should fulfill each part of the curriculum. This contrasts with other teachers she knows who do not fulfill all curriculum requirements, for example, those teachers who do not use a field study for the Biology 20 course. This result echoes earlier conclusions from The Activities and Identities Tool analysis, which shows that Zatanna considers the curriculum to be mandatory for all teachers. The difference is that while The Activities - Identities Tool represents Zatanna as the kind of teacher who views the curriculum as mandatory and positions herself as fulfilling all teacher duties; The Connections Building Tool reveals that she connects these ideas to form an overall perspective of the way she thinks Biology 20 may be taught.

Zatanna connects field study with winter, for example, she makes winter relevant to field study by using the following connections: field study → outside → timing was not well → winter (Example 7, line 6). By relating timing to the field study, she indirectly implies that field study can occur during seasons other than winter (Example 7, line 6). Zatanna, however, decides to do the field study during winter, and her decision was supported by the specific tasks of the field study design. These tasks could be completed only during winter and not in any other season ex. drilling holes through the surface of a frozen lake (Example 7, line 14), which suggests that Zatanna may specifically associate the winter outdoors with biology teaching. Her preference for incorporating the winter field study is best shown through the following topic

chain (for clarity wording used to link topics are included, see capitalized letters): winter field

study → so cool → AND → I use → THAT → with my Bio 20s as much as possible (example 7,

lines 16-17). The above topic chain demonstrates the way that she connects using the winter

field study as much as possible with her Biology 20 class. Using The Connections Building Tool

to analyze the topic chain reveals the way that the winter field study is relevant to her teaching,

ex. because it is cool (in addition to fulfilling curriculum requirements). In addition, there are

other ways that the winter field study is relevant to her teaching.

The Connections Building Tool reveals that Zatanna connects the outdoors with planning

in two main areas: off-campus locations and on-campus locations. She makes these connections

using relevance and lexical cohesion. Consider her description of bringing students outdoors:

Example 9

1. Well, it depends. If you go off school property, it's a pain.
2. There's all this paperwork that you have to do to get them off property and then you have to have a certain student to teacher ratio and I mean, it's a nightmare.
3. Which is why I typically don't go off school property because it's way too much work and then you have to get permission forms and you have to get money if you're taking a bus and you have to do this, I mean, it's just like so much.
4. So much work.
5. So we luckily have a place that I can go that's not off school campus.
6. But even then, it's like you have to plan for what happens if the kids don't bring appropriate footwear, what happens if they don't bring appropriate clothing, what happens if they don't do their pre-lab stuff, can you leave them in the classroom and then you guys go outside, if you're doing like what I do, which is, I do have the lab open.
7. You have to make sure there's another adult there to watch them.
8. I mean it's, and they're, they're not in a confined space either.
9. So you don't necessarily see them.
10. I mean cuz they could be, there's lots of places they could be in the area that I don't see.
11. So you have to make sure that you trust your students.

When she talks about bringing students off school property she directly connects it to a negative

connotation, including "pain," "nightmare," "too much work," "so much [work]," and "so much

work" (Example 9, lines 1-4). Zatanna makes these negative connotations relevant to going off

136

school property in line 3 when she uses it as the reason for not bringing students off campus. These negative aspects are supported by lexical cohesion since she expresses this negativity five times (Example 9, lines 1-4), emphasizing her dislike for requirements of bringing students to an off-campus location. Her view concerning the amount of work is supported by her assumption that there is no alternative to those requirements. This assumption is illuminated by The Fill In Tool since she does not mention any alternatives. Although Zatanna connects bringing students off campus with negative connotations, she feels differently about bringing students outdoors while remaining on campus.

Zatanna's language connects bringing students outdoors with remaining on campus, "we luckily have a place that I can go that's not off school campus" (example 9, line 5). She refers to remaining on campus (for outdoor activities) as "luckily" and this represents a positive view in stark contrast to the way she earlier referred to planning off-campus activities. This represents a positive outlook for bringing students outdoors since she can avoid administrative paperwork. Another connection is between an on-campus setting and the contingency planning needed: on campus → plan for students → inappropriate footwear → inappropriate clothing → incomplete pre-lab work (Example 9, line 6). Her connection represents that remaining on campus for an outdoor activity still requires work, including contingency planning, even if it's not paperwork. Her language makes other connections to the outdoors.

Zatanna's language also connects the outdoors with relationships, especially with students, in the following ways: strengthening her relationship with students and trusting her students. Consider the following description:

Example 10
[Zatanna's response to providing examples of positive results she has seen from students after incorporating outdoor activities. She mentions that she has been incorporating a field study for both terms of a school year over the past seven years.]

1. They dress better for the weather, I noticed.
2. So I like that, you know, when they have to be outside for longer.
3. But, I think for me, I think, I don't know, if we went out in the summer I think it would be the same.
4. But, I think you develop a better relationship with the kids because now you've done something that they don't do elsewhere in school.
5. Like it's a separate sort of fun thing to do.
6. It's like field trip, right?
7. A mini field trip.
8. And then the kids, at least at the time, I think, feel more connected to what's happening around them in terms of nature.
9. They get really excited about any animals that they find.
10. So like, I think this last time that we went out, there was, it was like an ant and something else.
11. And the kids were like shocked that they could see these things that were moving on the trees.
12. They just couldn't believe it.
13. And they were watching them, they would follow them, like going up the tree, and then they started fighting, and then one ate the other.
14. I don't know exactly what, I can't remember the whole scenario but, they were fascinated by it.
15. They were recording it, they used it as part of their field study project, they incorporated pictures from it and they were just like beyond fascinated by this thing, right?
16. And I think that that's the important part cuz it's like me saying, "This bug eats this bug."
17. Nobody's fascinated by that, right?
18. And so, they do get fascinated by that stuff and I like that.
19. I like watching them turn into little kids cuz they're so worried about being cool in high school.

The following connections from this description relate the outdoors with furthering her relationship with students: develop a better relationship with students → doing something they don't do elsewhere in school [winter field study] → separate sort of fun thing to do → like a field trip → mini field trip (Example 10, lines 4-7). These connections cohere with and are relevant to one another. The word "because" for instance, indicates that better relationships with students are due to the uniqueness of the activity (line 4). The word "like" makes line 5 relevant to line 4 by claiming that the notion of something only done with her class (the outdoor activity) is similar to the notion of a "separate" activity. In line 6 "it" is used as a substitution for outdoor activities

(as stated in the interview question) and Zatanna claims that outdoor activities are similar to field trips. Line 7 clarifies the claim in line 6 by incorporating the adjective "mini" (repetition of the world "field trip" indicates that this is the same "field trip" mentioned in line 6 and the description of a "mini field trip" is a clarification as opposed to a separate field trip). The following rewrite demonstrates the ways that specific words unite the connections to show relevance (words that connect topics capitalized):

> (outdoor activities) develop better relationship with students → BECAUSE → they do not do this elsewhere at school → WHICH IS SIMILAR TO → a separate fun thing → OR → a field trip → OR → a mini field trip

From the rewrite, it is clear to see that Zatanna connects unique class experiences (outdoor activities) with furthering her relationship with students. The connections also relate outdoor activities as a fun and original experience shared amongst her class. A unique experience means an original experience for students in that class, so that no one else in the school can share that experience with them. Since that experience is shared only by those in Zatanna's class, they know one another in a new and unique way. This familiarity and shared experience may lead to more trust, and a better relationship between Zatanna and her students. The trust that Zatanna has built is important to her teaching. Prior to and during an outdoor activity, Zatanna had to believe that she could trust students in an outdoor setting. The Connections Building Tool shows that Zatanna makes the winter field study relevant to trusting students through the following connections: winter field study → not in a confined space + don't necessarily see them + there's lots of places they could be in the area that I don't see → make sure that you trust your students (Example 9, lines 8-11). Her words "make sure you trust your students," likely refer to during and prior to the outdoor activity. From the Fill-In Tool, she assumes that trusting students before an outdoor activity is important since they will be working independently at different locations.

139

The importance of trusting students is reified with lexical cohesion when she twice says that she does not see the students during the winter field study (Example 9, lines 9-10). This stresses that not all students will be in her line of sight during the activity, further emphasizing the need for trust between herself and her students.

The Connections Building Tool also shows that Zatanna's language makes a connection between the outdoors and students' renewed interest in learning. For example, the sentence "the kids <u>love</u> going outside <u>much</u> more so **than** sitting in a classroom" (Example 7, line 18) reveals the following connection: students → love outdoors → much more than a classroom. The Cohesion Tool suggests that Zatanna's language emphasizes the degree of this preference using quantifiers (see underlined words above). The statement begins by stating how much students enjoy the outdoors, i.e. they love it, with the quantifier "love" representing that enjoyment. If the quantifier was changed to something less emphatic, such as "like" or "prefer," the degree of student preference changes. The word "than" provides context for that enjoyment, by comparing it to a classroom (see bold font). This first connection demonstrates that the students love the outdoors as a learning environment when compared to a classroom. This preference may have been the basis for students' renewed interest in learning. Consider the linguistic connection made when Zatanna describes students' behavior while outdoors: outdoors → students → excited → finding animals → fascinated → used in report (Example 10, lines 9-19). Her language emphasizes how excited the students are while outdoors, especially when they find a living creature like an ant crawling on a tree (Example 10, lines 9-17). Since the students were conducting a field study (Example 10, line 15), their excitement represents a renewed interest in learning. This is supported by Zatanna's use of lexical cohesion when she expresses eleven times

how excited students were at finding a living creature in a winter ecosystem. She also made other connections to the outdoors.

Zatanna's language also connected the outdoors in a way where teaching and experiencing the outdoors are relevant to one another. Consider the following connections from her language: it's biology (the school subject Zatanna teaches) → teaching about outdoors → experience the outdoors (Example 7, line 19). This connection makes experiencing the outdoors relevant to teaching biology since teaching about the outdoors is part of the curriculum (see above). When Zatanna says "it's biology," The Fill-In Tool suggests that she refers to the definition of biology. Rewriting her words by substituting the definition into the connection reveals the following connections: the study of life (biology definition) → teach about the outdoors → experience the outdoors. Zatanna is possibly connecting that life happens in the outdoors, in the world outside the classroom, or that she wants her students to relate course content to the world outside of the classroom.

In sum, The Connections Building Tool reveals the connections made in Zatanna's language, ex. field study to curriculum through relevance and lexical cohesion. Her language also makes the field study relevant to the winter season and to students' preferential learning environment and makes the outdoors relevant to planning activities for both off-campus and on-campus locations. A final linguistic connection is made between the outdoors and positive effects of her relationship with students as well as the outdoor setting's connection with students' renewed interest in learning. Zatanna's language builds a connection between the outdoors with teaching and experiencing the outdoors.

5.4 Social Language Tool and Doing, Not Just Saying Tool and Situated Meaning Tool

Social languages are distinct forms of language that indicate specific socially situated identities and their associated actions (Gee, 2011b), ex. within a high school classroom with students, an adult standing in front of the class who is pointing to a series of notes and diagrams may be socially recognized as a science teacher in the midst of giving a science lesson (an associated action with a science teacher). According to Gee (2011b) The Social Languages Tool examines how words and grammar indicate and portray a social language, and how their combination represents a socially situated identity. For example, Gee (2011b) further adds that speech can form collocational patterns that signify particular activities and situated identities, such as "co-relation" (correlation) or a combination of words and/or inflections. To aid in the identification of activities, The Doing Not Just Saying Tool determines what communication does beyond the surface level of words. The Situated Meaning Tool helps clarify a communication in its context, as the meaning of some words and phrases is altered by the situation (Gee, 2011b; Irwin & Hramiak, 2010). The Social Languages Tool was used to linguistically identify specific identities and activities in Zatanna's language. Results suggest that Zatanna enacts the identity of a biology teacher who is a specialist, has a strong relationship with students, and considers the outdoors as an appropriate learning environment for teaching biology.

The collocational patterns in Zatanna's social language indicate that she enacts the identity of a biology specialist teacher who takes ownership of students and their learning and considers the outdoors as a viable learning environment for biology. These collocational patterns emerge from her phrasing and word choice. When the questionnaire asks her to provide

examples of her use of the outdoors and why she chose this activity, she gives the following response:

Example 11

1. **Biology 20** – **we** did an **investigation** related to classification where **students collected or took pictures of samples** that were then **classified** using **Gitxsan classification and Biological classification** – this was used as **prep for a field study** and knowledge about different **classification systems**,
2. **Biology 20** – **field study** was performed which had **students analyze** how **abiotic and biotic factors influenced each other in an ecosystem**,
3. **Biology 30** – **walk through a forest** – this was done to show an **intermediate stage of succession** and why this was an intermediate phase

From the above example, the emboldened font indicates different items: specific courses (Biology 20 and 30) (lines 1-3), specific tasks undertaken by students (ex. collecting or taking pictures of samples, analysis) (lines 1-2), and the use of biology terminology (ex. Gitxsan classification, biological classification, abiotic and biotic factors, stage of succession) (lines 1-3). These words and phrases comprise a collocational pattern that "co-locates" a situated identity of a biology teacher, more specifically a biology specialist as opposed to a science generalist. Consider the way that a biology textbook, a DNA model, a chart of local flora and fauna co-locate with one another to indicate a biology teacher, while a general science textbook, chemistry equipment, a Newton's cradle, and a microscope co-locate to suggest a general science teacher. The specificity of some of her words, including Gitxsan classification, biological classification, abiotic and biotic factors in an ecosystem, and intermediate stage of succession are specific to biology, and would not appear in descriptions of other disciplines and/or general science. This initial example shows that the characteristics of Zatanna's social language co-locate Zatanna as a biology specialist. This is supported by Example 7 and these words are also content-specific to biology (ex. winter field study, ecosystem field study, going onto the ice, drilling holes, taking water samples, and comparison study) that co-locates them with one another to represent a

biology specialist. They also co-locate to show biology teaching, from the following pattern: Bio20, teaching, Program of Studies, my Bio 20s, and biology. Because these words are specific to a particular discipline, Zatanna recognizes herself as a biology specialist. Other phrases also support this recognition including "my 20s" (Example 7, line 17), which, after clarification with The Situated Meaning Tool, refers to the Biology 20 students (as opposed to other Biology 20 items that could 'belong' to her, such as textbooks, course syllabi, and others). Use of the pronoun "my" represents Zatanna as the kind of teacher who takes ownership for the students and their learning, reinforcing her identity as a teacher who has a strong relationship with her students. By saying "my bio 20s" this is a way of referring to a class common to teachers but not outside of that, i.e. the phrase "my [insert course name]" is a vernacular used specifically by teachers.

In addition to suggesting that Zatanna considers herself a biology specialist, her collocational patterns in Example 11 indicate her view of the outdoors as a viable learning environment for biology. This is evident from the reasons she provides for choosing a particular activity, ex. preparation for a field study, understanding two different classification systems, influences in an ecosystem, and characteristics of an intermediate stage of succession. These reactions are specific and together they represent what students can learn about biology in an outdoor setting. Together, collocational patterns and The Situated Meaning Tool suggest that Zatanna is a biology specialist teacher who has a strong relationship with her students and views the outdoors as an appropriate setting for learning biology.

The tools used above can also analyze language style. Language style indicates what a language does (what her language is trying to accomplish) and the authoritative source for that language. The Doing, Not Just Saying Tool helps clarify what a language does, ex. if a friend

144

promises to meet at the mall at a specified time, what his or her language is doing is making a promise; if a biology teacher asks the class, "what is biology?", that teacher's language is seeking to ascertain the students' view and/or understanding of biology. Analyzing Zatanna's language style shows that she seeks support for incorporating experience with theory when teaching about the outdoors. For example, when Zatanna describes the first time she used an outdoor field study, her description is structured to garner support for combining experience and theory. Part of this structure is revealed with The Topic Flow Tool (see Example 7) (each of the topics are numbered and vertically written for clarity below):

1. field study as mandatory (lines 1-3)
2. Winter field study is so cool and do this with Bio20s as much as possible (lines 4-17)
3. students prefer the outdoors as a learning environment than a classroom (line 18)
4. Teaching about the outdoors should include experiencing the outdoors (line 19)

From the Topic Flow, Zatanna presents the different reasons to incorporate outdoor experiences (topics 1-3) with biology teaching before stating her conclusion (topic 4). The comments for each topic are stated confidently, without hedging, and without offering exceptions or alternatives to her statement. This confidence is indicated by phrasing and quantifiers. For instance, the phrase "you're supposed to" indicates that the curriculum is mandatory and by proxy, so are field studies (Example 7, line 2). Similarly, in the phrase "winter field study is so cool" (Example 7, line 16), the quantifier "so" emphasizes how cool she thought the winter field study was, and the quantifier "much" in "with Bio20s as much as possible" (topic 2) stressed the frequency that she uses the winter field study. The adjective "love" used in "the kids love going outside" (Example 7, line 18) emphasizes the degree to which students enjoy the outdoors (this was discussed in further detail in The Connections Tool). These three topics attempt to convince the listener to support incorporating outdoor experiences with biology teaching. This is reified in her conclusion: "And it's biology so you think, 'if you're gonna teach about the outdoors, you

might as well be outdoors'" (Example 7, line 19), with the phrase "you might as well" representing something that should be done. This topic flow shows that Zatanna's statement is structured for the listener to follow the order of her reasoning so that at her conclusion, the listener has no choice but to be supportive based on the reasons she provided. Ultimately, her language seeks support for incorporating outdoor experiences when teaching biology.

Analyzing language style considers the source of authority, ex. the justification for what was said in the way it was said. The way that Zatanna's language justifies incorporating the outdoors is based on the outdoors as a viable learning environment for biology and what she has personally experienced when using outdoor activities. Her description for using outdoor activities, for example, is justified by what students can learn from an outdoor setting (as described earlier from the collocational patterns in example 11) while other examples are justified by her personal experience with students during outdoor activities. As mentioned earlier, Zatanna's language is organized in a particular way to garner support for combining outdoor experiences with biology teaching (Example 7). Her justification is based on her personal experience, ex. witnessing that students are more engaged with their learning in an outdoor setting (Example 7, line 18). From other field study experiences over the past seven years (example 10), she observed that students dress more appropriately for the weather (line 1), her relationship with students develops further (line 4), and that students become more aware of their surroundings as represented by their fascination of finding a live ant in a winter ecosystem (lines 8-15). These justifications suggest that she incorporates the outdoors based on what she thinks can be learned (about biology) in an outdoor setting and what she had experienced from using outdoor activities over the years and may represent her to be the kind of science teacher

who values what students can learn from an experience and whose teaching practice is influenced by her past experience with students.

Zatanna's language style works in conjunction with The Doing, Not Just Saying Tool to reveal the characteristics of her social language. These characteristics are indicated by collocational patterns (phrasing and word choice) in a few key examples. Analysis and support from The Situated Meaning Tool and deixis and lexical cohesion indicate that Zatanna's social language enacts the identity of the kind of biology teacher who is a biology specialist, has a strong relationship with students, and considers the outdoors as a viable learning environment for biology. This is complementary to results from Zatanna's social language style, ex. what her language seeks to accomplish (as revealed by The Doing, Not Just Saying Tool), and the source of authority behind her language (the way that she justifies her teaching practice). The Doing, Not Just Saying Tool demonstrated that her language seeks support for incorporating the outdoors into curriculum. The source of authority reveals that the justification for what she says is based on the potential learning benefits of the outdoors, and her personal experience.

5.5 The Figured Worlds Tool

In Zatanna's Figured World, teaching is focused upon students. This was best exemplified in a few different ways. For instance, The Significance Building Tool helped clarify the emphasized aspects of her teaching practice (see the description below that was rewritten to only show the significant aspects from her description),

> Every year I try a bunch of new teaching activities. I do not mind putting in the work. I will try a bunch of new things and only keep the ones that work. I do not want to repeat activities which do not work, and I want to find better activities than what I have.

The above description portrays Zatanna's Figured World of teaching as improving teaching

activities. In this world, teaching is not static since she changes some of the activities she uses

each year. However, Zatanna changes those activities in a specific way. She wants to find new

activities that are more effective than the activities she is already using. Improving her repertoire

of teaching activities indicates that Zatanna values the quality of her teaching and student

learning.

Another way that Zatanna focused upon students was by helping them reach their

potential. One of her teaching goals is to help students be the best that they can be (consider the

following description),

> Example 12
> [Researcher asks Zatanna to describe her view of teaching.]
>
> 1. I guess helping my students be the best, cliché as it sounds, the best they can be or want to be in certain things.
> 2. Especially cuz I teach high school, right?
> 3. Cuz like lots of them don't like science.
> 4. That's ok.
> 5. I would never, like, I guess most of them are at a point where, if they've hated it for this long, let's try and make sure that you have a pleasant experience this last time through and then go do your fill in the blank, whatever you actually care about.
> 6. So I don't think...yeah, I guess it's more important, to like focus on the student themselves and not so much the subject matter you're teaching?

The above description shows that Zatanna wants to do more than to help students improve, she

wants students to be their best (line 1). This shows that she values helping them reach their

potential and may also value developing their self-confidence. Furthermore, the description also

shows that Zatanna values students more than subject matter. In her Figured World she teaches

for the students instead of teaching for the subject matter.

Zatanna also focused upon students by helping them become future members of society.

This was best exemplified when she described what was important to her as a teacher other than

a sense of respect,

Example 13

1. I don't think anything else is important in my teaching.
2. I mean cuz, and I guess as I'm going through, in the end, the kids that are going to university do well despite you.
3. And so, the subject matter, I mean, the thing is, like I know my subject matter and I don't ever worry about that, like that's not something I worry about.
4. I know I can teach this subject matter and I know that the high academic kids learn from me and they like it, blah, blah, blah.
5. So I don't have to worry about that.
6. I just don't feel like it's important because it's just something that happens.
7. This and other things cuz you're like training these little people to be adults.
8. Well, like those things about respect and those kinds of things.
9. Those are more important to me than the subject material.

The description reveals that one of the ways Zatanna views teaching is to train students to become adults (line 7). Cohesively, the word "things" was repeated twice (lines 7-8) in order to link how to be an adult with respect. This seems to indicate that Zatanna may consider part of adulthood as acknowledging and giving respect. Additionally, the description also shows that teaching respect is more important than teaching subject content (line 9). Together, these examples show more details of Zatanna's Figured World. Teaching respect is more important than teaching subject content because the students are being taught how to be adults.

Overall, these examples provide further insight into Zatanna's Figured World. In her Figured World, teaching is focused upon students in a few different areas. One of those areas is student learning. When she described trying new activities each year to find more effective ways of teaching, this demonstrated her non-routinized style of teaching and her value towards student learning. Her focus on students was also shown in the way that she helps students. One of her teaching goals is to help students reach their potential and this may indicate that she also helps develop their self-confidence. Another teaching goal is to help students become adults by teaching them how to be respectful. In sum, Zatanna' Figured World of teaching is focused upon the academic and social well-being of students.

5.6 Case Summary: Zatanna

Zatanna recognizes herself, and is recognized by students, other teachers and school administration as the biology teacher who incorporates the outdoors (shown by The Connections Building Tool). Through her specific vocabulary when describing why she incorporates certain outdoor activities, she enacts the identity of a specialist biology teacher.

Results from the discourse tools show Zatanna as the kind of teacher who is responsible towards her teacher duties and prioritizes students. The way that the discourse tools, specifically, represent Zatanna as a responsible teacher towards her duties was by valuing the fulfillment of curricular objectives (as revealed by The Figured Worlds Tool). She also considers the curriculum to be mandatory for all teachers (indicated by The Activities and The Identities Building Tool), ex. incorporating outdoor activities to complete curriculum requirements (shown by The Connections Building Tool, The Activities and The Identities Building Tool).

The discourse tools, together, also show Zatanna as the kind of teacher who prioritizes students by valuing their learning, and her relationship with them. She valued student learning by incorporating effective activities and searching for better activities that were conducive to helping students understand biology (shown by The Significance Building Tool). She observed student reactions to help her determine an activity's effectiveness, ex. since students reacted positively during the winter field study she continued to incorporate this activity with her Biology 20 teaching (as revealed by The Activities and The Identities Building Tool). Because the winter field study helped students further their understanding of winter ecosystems, her use of this outdoor activity was for pedagogical reasons as opposed to strictly fulfilling curriculum, or a change of scenery, or other reasons unrelated to student learning (shown by The Activities and The Identities Building Tool). In this manner, the outdoors is a viable learning environment

for biology where students can connect theory with experience, and further their practical skills, ex. sample collection, observation, and recording data (as shown by The Social Languages and Doing, Not Just Saying and Situated Meaning Tool). While spending time outdoors with her students, Zatanna found that the students showed a renewed interest in learning through their enthusiasm (based on results from The Connections Building Tool).

Zatanna also valued students by building a relationship based on trust and mutual respect. She has a strong relationship with her students and her trust was shown by allowing them the same privileges that she has and creating a distraction-free environment (to demonstrate her value for their learning) (shown from The Relationships Building Tool; The Social Languages and Doing, Not Just Saying and Situated Meaning Tool). These equal privileges helped develop a sense of mutual respect that contributed towards her relationship (as indicated by The Significance Building Tool). From incorporating outdoor activities, she found that her relationship with students was strengthened (revealed by The Connections Building Tool). These results represent Zatanna as enacting and being recognized in a particular way.

Zatanna is recognized as a biology specialist and the only biology teacher at her school who incorporates the outdoors. She enacts the kind of teacher who fulfills teacher duties and values students. For her, teaching is about helping students with their learning, with reaching their potential, and with teaching them respect.

Chapter 6

Case: Shiera

6.1 The Significance Building Tool

The language in Shiera's description indicates that the future (with respect to society and the natural world) and teaching confidence were significant areas of her teaching practice. For Shiera, "future" refers to the ways she hoped she influenced students to affect society and the natural world after they graduate from high school. The Significance Building Tool indicates that trust, relationships, authenticity, and integrity are significant to her practice in the hopes that these students would be "good people" in the future who positively affect society. Consider the following description in its entirety (significant areas underlined):

Example 14

1. Um, maybe one of the most <u>important things, as a teacher</u>, um, I'd, I'd say there's probably two words that pop into my head right away.
2. And number one, is <u>trust</u>.
3. That, <u>students trust you</u>, that <u>you trust students, that you trust the people you work with and work for</u>, right?
4. And then that <u>relationship is sound</u>.
5. Once that relationship is sound, then <u>learning is gonna happen</u>, you know.
6. It's almost like you can't prevent it from happening.
7. So that, that <u>relationship and trust</u>, and all that stuff that goes with it is *really* <u>important to me</u>.
8. And trust goes with you know, um, always <u>saying what you're gonna do</u> and <u>do what you're gonna say</u>, right?
9. So I mean, you, you have to be...<u>trustworthy</u>. Right?
10. Um...and the other thing is probably, you know that trust and relationships are really closely, so I'd put that kind of together right?
11. Trust and relationships.
12. Because once you develop that trust and those relationships, <u>everything else just kind of flows</u>. Right?
13. It doesn't even, whether it's education or not, or whatever, it just works. Right?

14. Um...and the other thing is probably, probably related, it's kind of, kind of like a, there's two words and they're kind of ringing around in my head, and they're authenticity and integrity. Right?
15. That, that, that's what you are and that's what you show to students, and that's what you would like those students to be when they go out into the world.
16. Like I don't really care if they know the Heisenberg Uncertainty Principle.
17. And I don't really care if they know how to do water tests.
18. What I want them to be is good people, right?
19. To know that they can *trust* people.
20. Like teachers, to know um, that the whole kind of system is gonna hold together for them.
21. And that they can go and they can go out there and trust it to be there for them.
22. So when they go to get a job, they'll want to follow those rules and be part of society and you know, just kind of be good people too, be good people back, right?

Those significant areas were interpretively decided as the areas that support the purpose of her communication. Although Shiera is asserting these areas, she also uses other words and phrases to increase and decrease their significance. For instance, the words she uses to increase significance are replicated here: number one is trust (line 2); learning is gonna happen (line 5); really important to me (line 7); you have to be trustworthy (line 9). The descriptions in these lines are all positive. If those descriptors were changed to negative or doubtful words such as "ranked last," "might happen," "possibly," and "could be," their significance becomes reduced. Furthermore, roughly half of the areas emphasized are about trust. The words "trust" and "trustworthy" are lexically cohesive to one another and these multiple phrasings for the concept of trust represent its importance. This concept's importance is reified by repetition: "trust" is used ten times and "relationship" six times.

In contrast, there are also areas of decreased significance, which are replicated here: ex. maybe one of the most important things (line 1); almost like (line 6); kind of together (line 10); and kind of flows (line 12). While these language choices could indicate a lack of confidence in what she is saying, it is unlikely since she has more than 27 years of teaching experience; instead,

her language decreases significance in these examples by acknowledging areas other than trust that may contribute towards student learning. For example, in line 1, her words "maybe one of the most important things as a teacher" shows that a teacher may have multiple values such as other possible barriers to learning (line 6), other values paired together other than trust and relationships (line 10); and the classroom learning climate may be influenced from areas other than trust and relationships (line 12). Topic chains (via the grammatical tools The Topic Flow or Topic Chaining Tool) help clarify the ways that those areas are made significant and the way they relate to one another. Consider the way Shiera's language topically relates trust and relationships:

Topic Chain 1: (lines 1-12)

trust → with students, teachers, administration → sound relationship → relationships and trust → trustworthy → everything flows

In this initial topic chain, trust and relationships are significant to Shiera based upon her emphasis of trust, learning, trustworthiness, and the importance of trust and relationships. The topic chain illustrates the results of trust, that is, once trust is established with students, teachers, and administration, then a sound relationship is likely.

In addition to Shiera's use of descriptors that increase or decrease significance, there were other aspects of her language that indicated her values. Consider the way her language made certain areas significant to indicate her teaching goals (as shown in the topic chain below),

Topic Chain 2 (lines 14-19)

Authenticity and integrity → what you are showing to students, what you want your students to be → good people → trust people

In this chain, her language increases significance through a vocal emphasis of the word "trust" (line 19). In this example, Shiera's language seems to suggest how she wants students to be in

the future and how her relationship with them is part of achieving that goal. Both topic chains and the use of increased significance emphasize trust. The first topic chain also stresses relationships while the second topic chain highlights authenticity and integrity.

For Shiera, "future" refers to the time after her students graduate and her values for the future are evident from the significant aspects of her language. The Significance Building Tool indicates that caring for the natural world is another significant aspect of her teaching practice. This is evident by applying The Topic Flow or Topic Chaining Tool, which helps discern the areas her language emphasizes. Consider the topic chain based on the following description (when Shiera was asked whether the outdoors is important to her teaching):

Example 15

1. Uh, yes.
2. Not just the outdoors but environment, yes, **very** much so. Right.
3. Well because first of all, I feel like what the students have experienced in nature, once you have that appreciation for nature, then you're more likely to take care of it.
4. And these, these people that are coming through our schools, I think about *thousands* of students I've had come through my classrooms and if I can influence even 10% of those to go out and take better care of their world, then I've made a difference in this world. Right?
5. That those people will have some, anybody who goes out and goes to the mountains and goes hiking, has one of those experiences where it's just fantastic, can't go home and just throw their McDonald's container out the window. Right?
6. It's not consistent with their beliefs and so if you can have a belief system where the environment is important to you and you can convey that to your students, maybe somewhere down the line we'll take a little bit better care of it.
7. I think that is **very** important.
8. That is one of my core beliefs, right?

Topic Chain 3:

environment (important to teaching) → experience nature → appreciate nature → take care of nature → influence students to take better care of the world → (belief system) environment is important → convey to students → core belief (of Shiera)

Topic Chain 3 makes clear that Shiera's goal is to convey her core belief, caring for the environment, to students. As in examples above, her language also increases the significance of certain areas, including use of the quantifier "very" to stress the importance of the environment (line 2 and line 7, bold type). These two examples are lexically cohesive to one another, representing another way that her language emphasizes the importance of caring for the natural world. Additionally, her language adds significance when she uses "core" to describe the extent of the importance of taking care of the environment.

Shiera chooses specific words to increase significance. This example demonstrates several areas: taking care of the environment as a core belief; wanting students to have a belief system where the environment is important; and hoping that in the future (her) students will take better care of the world. It is clear to see from this example that one of her personal goals of teaching is to convey a belief and/or value system for the environment to her students for the purpose of better environmental care in the future.

Another significant area demonstrated by Shiera's language is confidence with respect to student impact, teaching accountability, and teaching ability. When Shiera describes her technique for teaching the advanced classes--Advanced Placement (AP) and International Baccalaureate (IB), the significant area is the importance of confidence in teaching. This was made clearer by The Topic Flow or Topic Chaining Tool based on the description below,

Example 16

1. Um, because you really have to have the confidence to present that.
2. And students like it when they feel confident in you. Right?
3. If they feel, and I've seen it happen with student teachers more times than I can count, if they lose confidence in you, if they think that you can't guide them through it, then you've lost them.
4. Those higher level students, um, the science 14, 24, they just wanna get through it and if you pass 'em on a test, they're happy, they don't care how much they learn.

5. But those upper level IB students that are headed into medicine or whatever they want to know that they are learning what they are supposed to be learning and they're learning it well and maybe even learning it more than they have to because they eventually feel like they're going to be held accountable for it.
6. And so they hold you very accountable.
7. So I think it's ok to learn with students in some contexts, absolutely.
8. But in situations where the accountability level is high, and students have to go on to very high-level studies then people have to have the confidence to be able to teach at that level.
9. And to have the confidence, you have to have more knowledge than your students do.
10. And it's not necessarily knowledge in terms of facts, it's knowledge in terms of how that science works, right?
11. You have to be able to guide them through it.
12. If you can't write a balanced chemical equation, then you can't teach chemistry. Right?
13. So there's a certain amount that you can learn with your students.
14. But there's a certain amount that you just have to be able to do it and you have to be able to do it better than them.
15. And, even better, you have to be able to show them how to do it in the way they understand.
16. And to be able to show them in a way that they understand, you have to have some kind of depth of understanding yourself.

Topic Chain 4: (lines 1-3)

confidence in teaching → students confident in you → without confidence you lose students

Topic Chain 4 makes clear that one aspect of the importance of confidence in teaching is to maintain a learning atmosphere where the students trust the teacher as their academic guide. Consider the way Shiera's language uses two emphatics, "really" and "have to" (line 1) (as revealed by The Cohesion Tool) to doubly emphasize the significance of confidence when teaching higher level courses. More information is added through "when" (line 2) because confidence in teaching relates to the way that students respond to that confidence. The background information provides further context that students like a teacher with confidence. To

157

emphasize this point, the rhetorical question "right?" at the end of the sentence (line 2) is a way for Shiera to position the listener as a science teacher (since all the comments are specific to science teaching experience) who supports her (this echoes results from the same rhetorical device used in Example 14). The emphatic "more" (line 3) stresses the amount of times she had seen students lose confidence in a teacher. Her language further emphasized her claim by using a conditional statement (line 3) to demonstrate cause and effect (below)

> IF students think that you cannot teach the material (cause) THEN you've lost them (effect)

The sentence that follows (line 4) provides background information and is an exception: a teacher's confidence is irrelevant in the context of non-academic classes where student priority focuses on passing as opposed to the quantity and quality of what they are learning. This information also sets up a comparison between non-academic and academic students.

Another aspect of the importance of confidence in teaching is accountability. This new information is introduced by "but" (line 5), that also compares different kinds of students and shows that Shiera believes that non-academic students do not care as much about the amount they learn compared to academic students. Shiera describes academic students as caring about the amount, content, quality and quantity of their learning. Her language emphasizes the significance of quantity with the emphatic "more" (line 5). Her language also provides a reason for students' attitude as indicated by the word "because" academic students feel that they will be accountable for their learning. Shiera's language then uses "and" (line 6), to add the information that academic students hold themselves and their teacher accountable for their learning. Consider the following topic chain from Example 16 (words linking the topics are indicated by capitalized letters):

Topic Chain 5: (lines 4-6)

students in higher level courses want to learn and learn well → BECAUSE → students feel accountable for their learning → AND (therefore) → (students) hold teacher accountable

Combining Topic Chains 4 and 5 demonstrates the relation between confidence in teaching and accountability:

confidence teaching → students confident in you → without confidence you lose students → students in higher level courses want to learn and learn well → students feel accountable for their learning → (students) hold teacher accountable

This combination clearly shows Shiera's view that confidence in teaching matters to students, especially the kinds of students who take higher level courses and want to ensure the quality and quantity of their learning.

One more aspect to consider in terms of confidence in teaching is the ability to teach. This new information is signaled in line 8 by "but" that compares high versus low accountability levels with respect to student learning. Shiera's language then relates accountability with confidence through "then," (line 8), implying that in high accountability situations, teachers must be confident. The following topic chain demonstrates the way her language made confidence in teaching significant (interpreted as the purpose of her communication):

Topic Chain 6: (lines 8-12)

confidence teaching higher level courses → (teacher has) greater knowledge than students → (teacher) knowledge how science works → (teacher as) guide for higher level learning → without ability, cannot teach

Here, Shiera's language relates confidence and ability to teaching within high accountability situations. Linguistically, confidence is further emphasized by the phrase "have to" (line 8) that indicates she views teaching confidence as a necessary trait. Her language also relates confidence with having more knowledge than students by the use of "and" in line 9. To increase

159

the significance of having more knowledge than students, the phrase "have to" (line 9) is used

again to convey a sense of necessity. In the following line (line 10) she specifies the type of

knowledge teachers need in high accountability situations with the phrase "how that science

works." The significance is interpreted as synonymous with the objective of her communication.

To clarify this kind of knowledge, the background information provides further significance by

comparing it to strictly factual knowledge that is insufficient for teaching academically rigorous

courses. Further significance is provided by the rhetorical device "right?" (line 10) that positions

the listener as a science teacher who supports her (akin to similar results from Example 26).

Another trait that a teacher must possess, according to Shiera's language, is the ability to guide

students. The phrase "have to" (line 11) is repetitive of something required. To further stress the

significance of teacher ability, here she uses a conditional statement (if/then, line 12) to

demonstrate its importance:

> IF a teacher lacks certain scientific knowledge (the condition, such as balancing a chemical equation) THEN that teacher is unable to teach that science (the conclusion, such as teaching chemistry)

Another way that Shiera's language emphasizes the significance of teaching ability is through

the rhetorical question "right?" (line 12) at the end of the sentence. Again, Shiera positions the

listener as a teacher who is supportive of her. Teaching ability is also highlighted through

comparison, namely, teacher ability to teach and teacher ability to perform better than students.

Consider the following topic chain (words linking the topics are capitalized and included for

clarity),

> Topic Chain 7: (lines 14-16)

> (teacher is able to) do things better than students → AND → (teacher) show students so they understand → AND → (teacher must have) depth of understanding

Topic Chain 7 shows that Shiera relates teacher ability with performing better than students, conveying information to students in their perspective, and understanding the content better than students. The word "and" (line 15) that connects lines 14 and 15 adds the information that in addition to performing better than students, a teacher must be able to teach to students in a way where they will understand the content. In addition to teaching ability, her language insists that a depth of understanding is a necessary quality for teachers in high-accountability situations. For Shiera, that level of understanding is mandatory as represented by the phrase "have to" (line 16).

Combining Topic Chains 4-7 demonstrates the way that these areas relate to teaching confidence (words connecting the topics are capitalized to show the coherency of Example 27 between its associated topic chains):

> (Topic Chain 4): confidence in teaching → AND → students confident in you → IF (they feel teacher lacks confidence) → without confidence you lose students; → BUT → ; (Topic Chain 5): students in higher level courses want to learn and learn well → BECAUSE → students feel accountable for their learning → AND (therefore) → (students) hold teacher accountable; → BUT → ; (Topic Chain 6): confidence teaching higher level courses → AND (to have confidence) → (teacher has) greater knowledge than students → AND → (teacher) knowledge how science works → HAVE TO (have ability) → (teacher as) guide for higher level learning → IF NOT → without ability, cannot teach; → BUT → ; (Topic Chain 7): (teacher is able to) do things better than students → AND → (teacher) show students so they understand → AND → (teacher must have) depth of understanding

The combination of these topic chains demonstrates three ways that confidence is significant to teaching: teaching confidence as a way of encouraging confidence from students; teaching confidence is needed in high accountability situations; and teaching confidence as an indicator of teaching ability.

Overall, The Significance Building Tool indicates that the future of students in society and teaching confidence were significant aspects of Shiera's teaching practice. Her language indicates the significance of these areas through the use of descriptors, quantifiers, and specific

wording. The Significance Building Tool also reveals that teaching confidence is significant to her teaching with respect to student impact, teaching accountability, and teaching ability.

6.2 The Activities - Identities Building Tool

Shiera describes teaching in a way that is commensurate with an activity (it has a social, institutional, or cultural significance) as opposed to an action (that does not have the same kind of significance). Teaching, as an action, takes place in everyday forms of teaching, such as a parent teaching a child how to tie his/her shoes, or a friend teaching another friend a recipe. For Shiera, teaching is non-routinized, and the teacher is the source of knowledge.

Teaching style differs due to a teacher's decisions and circumstances, so that teaching is not limited to a set routine and is dependent upon a teacher's decisions, such as trying different teaching methods. Shiera chooses to use different teaching methods and describes that decision (below)

Example 17

1. Yeah, I think that's very much what I do.
2. I think you kinda nailed me there.
3. That's very much what I do.
4. Um, I like to do the same thing twice because I like to try it again but then after two or three times, then I'm tired of it and I wanna do something different.
5. You're absolutely right.
6. And so, yeah, very much, I like to change it up every time I do it.
7. Sometimes it changes itself, so when you do a self-designed field study every year, students are just changing it themselves, right?
8. They're different kids, they're doing different things you don't have to change the way you do things because it's gonna be different every time.
9. But some things, I like to change.
10. Um, and it's always something *different* that I'm changing.
11. Sometimes I'm doing more stuff on-line.
12. I tried that last year.
13. Sometimes I'm doing more stuff with equipment in the lab. Right?

14. Sometimes I'm doing things more with um, philosophical perspectives on things like the atom, right?
15. So there's always something different.
16. I'm kind of scattered in that I don't have one thing that I marshal, right?
17. I don't have one thing that I concentrate on.
18. I like to dabble in all kinds of things.
19. Makes life interesting.

Example 17 highlights the different reasons and ways that Shiera uses various teaching methods. Her use of variety is supported by repetition of the phrases "that (trying something different) is very much what I do" (repeated twice, lines 1 and 3), and "always something different" (repeated twice, lines 10 and 15). She uses repetition of the words "different" (six times) and "change" (six times), emphasizing variety in teaching. She also repeats that she tried other ways of teaching, including the phrases "I don't have one thing" (repeated twice), and "I like to dabble in all kinds of things". She also notes that circumstance contributes to variety in teaching, and as an example she uses a self-designed field study each year. While this may not seem to initially indicate variety since it follows the same method, the field study is designed by a new class of students each semester so that each study is different. Shiera's language seeks support from the listener by using the rhetorical device "right?" (lines 7, 13-14, 16), and treats the listener as a fellow science teacher. Topic Chain 1 clarifies her description:

Topic Chain 1:

That (trying something different) is very much what I do → after two or three times I'm tired → I want something different → I like to change it up → it can change itself (ex. student designed labs) → some things I like to change → always changing something different (ex. through on-line activities, lab equipment, philosophical perspectives) → I don't have one thing → I like to dabble in all kinds of things → makes life interesting

Topic Chain 1 suggests the kind of teacher who enjoys variety and the desire to try other teaching methods. This shows that the activity of teaching is non-routinized and that she appears

to be versatile and flexible with her teaching. For Shiera, teaching is an activity that constantly renews her interest because of the opportunity to try other teaching methods.

In the case of accountability situations, versatility and flexibility with teaching is needed. Shiera's language in Example 16 also suggests that she values accountability, and that there are low and high accountability situations. A low accountability situation is best exemplified in line 4 where Shiera describes some students as not caring as much about their learning when compared to others. A high accountability situation is the opposite, such as a class with the kinds of students who care a great deal about their learning. Consider the following topic chain:

Topic Chain 2:

students in higher level courses want to learn and learn well → BECAUSE → students feel accountable for their learning → AND (therefore) → (students) hold the teacher accountable

Topic Chain 2 shows that students in higher level courses care more about the quantity, content, and quality, of their learning (from The Significance Building Tool, these areas were significant in her language with respect to teaching confidence). This has institutional significance and demonstrates teaching as an activity rather than an action, because students at Shiera's school care about their education. According to Shiera, the kind of teaching involved in high accountability situations also has cultural significance because it requires the kind of teacher who has knowledge, confidence, and ability. Because those students want to learn more, that teacher needs more knowledge that could increase teacher confidence and that would provide a sense of assurance to students. Shiera also describes the students as wanting to learn the material well, would require a teacher with the ability to explain content in a way students understand and who understands content better than students. According to Shiera, these traits are significant to teacher culture because they describe qualities of a certain teacher, who is suitable for high

accountability situations. Shiera describes teachers in high accountability situations as those who know the content material well and can communicate clearly with students. This may indicate teaching as an activity of knowledge transfer. From Shiera's description, teaching style differs depending upon the level of accountability, and this demonstrates flexibility in her own teaching style to alter her teaching based on accountability levels.

One way that Shiera's language strengthens her position as a source of knowledge within her classroom is through her description of returning to post-secondary studies. She explains her decision when asked the question, "What made you decide to go back and finish your science degree?"

Example 18

1. You know what it was?
2. It was the students.
3. Because the students were very keen and so when I was teaching certain subjects I felt that I didn't have enough knowledge to teach them as much as they were capable of learning.
4. And not just knowledge, just the, just my whole background was not sufficient to be able to, I didn't have enough depth to be able to really do it justice. Right?
5. So I wanted to go back and get background, depth, exposure.

The above example shows that she wanted to further her scientific background to help her with her teaching. Although the activity of returning to post-secondary studies is not specific to teaching, Shiera's reason is specific in that she sought greater depth of scientific understanding for teaching. This activity represents Shiera as the kind of biology teacher who values knowledge, particularly the kind of knowledge learned in a formal setting such as post-secondary studies and this represents her value that teachers should have more knowledge than students (to be able to challenge them on an academic level). Consider the following topic chain (words connecting topics included for clarity and are capitalized),

Topic Chain 3:

teaching certain subjects → (SHIERA) FELT THAT → she did not have enough knowledge to teach to the capability of students → AND → her background was insufficient, ex. not enough depth → SO → she went back to school to get background, depth, exposure

The language in Topic Chain 3 emphasizes the importance of more knowledge to teach to the capability of students. This was supported by lexical cohesion—multiple phrasings of her lack of knowledge to teach to the capability of students, for example: I didn't have enough knowledge to teach (Example 18, line 3); my whole background was not sufficient (Example 18, line 4); I didn't have enough depth (Example 18, line 4). Her language positions the listener as someone familiar with science teaching who wants to academically challenge students, as can be seen by the rhetorical question, "right?" (line 4). (This finding is consistent with previous examples that examined her use of rhetorical questions.) Shiera's desire for the teacher to be the most knowledgeable person in the classroom suggests her view of the activity of teaching as a top-down approach as opposed to a communal approach (where a community learns together). Her language, furthermore, indicates that she is the kind of teacher who has depth of background knowledge and who tries to academically challenge students.

From Shiera's language, teaching is an activity without a strict routine, as indicated through cohesion (repetition and lexical cohesion); and topic chaining. Her language is also suggestive of teaching with cultural significance by relating particular characteristics (knowledge, confidence, and ability) with particular teaching settings (high accountability situations). This was reified through topic chain and lexical cohesion, and a rhetorical device that may show her viewing the teacher as the source of knowledge. Shiera's language represents teaching as an activity with variety, and flexibility dependent upon the situation.

6.3 The Connections Building Tool

When people communicate with one another, they may be connecting or disconnecting bits of information. The Connections Building Tool considers how words and grammar connect, disconnect, and make relevant and/or irrelevant different things (Gee, 2011a, 2011b). Several other tools were used for support such as Cohesion since it relates different parts of a communication to each other (Halliday, 1985; Martin, 2001/2003; Schiffrin, 2001/2003). The Topic Flow or Topic Chaining Micro Tool is related to cohesion since it examines how topics are linked to one another to contribute towards coherence (Gee, 2011b). The Connections Building Tool was supported by Cohesion and Topic Flow or Topic Chaining and reveal that Shiera linguistically connects the outdoors with taking care of nature, a positive experience, bonding with students, and teaching.

Shiera links the outdoors with taking care of nature by connecting them in a specific order. Consider the following description,

Example 19

1. Well, there's a few things.
2. I think first of all, I don't think you can experience nature unless you're in it, you know.
3. Really, I guess I've had a lot of experience with nature in my life, right?
4. And I have had this feeling of, 'this is wonderful,' you know, 'this smells great, this looks great, this is, this is an inspiring experience,' right?
5. I guess I wanna pass that onto my students.
6. Um, and it's a real bonding experience with the class.
7. Especially when you do it in September when you're just starting out with a class.
8. I usually develop a relationship very quickly with those students.
9. And it's a different kind of relationship than you have when they're sitting in a desk.
10. So, like I told you last time we, this last time we went out, we all sat around and ate lunch together.
11. And you know we just talked about stuff and it's got nothing to do with ecology either, about, you, you know, what they did at their Grade 2 birthday party or something. Right?

12. Its got nothing to do with the, with what you're doing but it's that relationship.
13. They get to know you on a little different level and you get to sit on the grass with them and eat lunch and you know, they can make fun of you and stuff.
14. And that is really good.

She initially connects the experience of nature while being outdoors with the phrase "I don't think you can experience nature unless you're in it" (Example 19, line 2). The pronoun "it" cohesively refers to the idea of the research question that was the outdoors. By substituting this idea into her statement, it now reads as, "I don't think you can experience nature unless you're in the outdoors" and this demonstrates that Shiera considers nature to be outside. Another way of phrasing her statement is, "I think you can experience nature in the outdoors" or "I don't think you can experience nature if you are indoors" and both reiterate experiencing nature while outdoors. Next, she connects experiencing nature (while outdoors) to appreciating nature to taking care of nature. For instance, "I feel like what the students have experienced in nature, once you have that appreciation for nature, then you're more likely to take care of it" (Example 17, line 3). She considers experiencing nature to be synonymous with appreciating nature since there is no causal link between them. Additionally, she views appreciating nature as a basis for taking care of nature as indicated by the adverb "then." Written as a topic chain it may look like:

experience nature → appreciate nature → take care of nature.

This chain is supported by the additional statement made by Shiera, that "anybody who goes out and goes to the mountains and goes hiking, has one of those experiences where it's just fantastic, can't go home and just throw their McDonald's container out the window" (Example 17, line 5). Aligning this example with the topic chain produces the following new topic chain:

experience nature → appreciate nature → take care of nature
hiking in the mountains → fantastic experience → unable to litter

This alignment clarifies the topic chain as a series of relevant connections: experiencing nature is so positive that it is a basis for appreciating nature, and that appreciation is a basis for taking care of nature.

Shiera connects the outdoors with a positive experience using two main methods. First, she used language structure and lexical cohesion across three different examples to indicate positive feelings when describing experiences in nature: "I have had this feeling of, 'this is wonderful,' you know, 'this smells great, this looks great, this is, this is an inspiring experience'" (Example 19, line 4). She viewed her experiences with nature while outdoors in multiple positive ways, emphasizing the connection between the outdoors and positive experiences. Secondly, Shiera made a connection between the outdoors and positive experiences by planning. When planning outdoor activities, she considered weather conditions, student enjoyment, and student ability, all for creating a positive experience for students. In terms of planning for weather conditions, Shiera tried to maximize the chances of a positive experience for students by having multiple dates to avoid bad weather.

Example 20

1. Yeah. Like I said, we, we, we tell students that they should plan on coming and going, just in case we decide to go.
2. If it's miserable out we don't go, and we tell students to dress for the weather so they all come with their, well not all of them, but some of them come with rain boots and their, and their rain jackets and stuff, just in case.
3. But we always cancel if the weather is really rotten.
4. Just because students do not have a positive experience you know so yeah, then you have to re-plan it all, you have to re-book it, the bus, and you have to re-book the place, and to, you know, sometimes you even have to re-do the forms.
5. But I have gotten smart on that and what I do, is I put 2 or 3 dates on my permission form, so the parents only have to sign it once.
6. Then, if it rains, you just go on the next date, they've already signed the form. Right?

7. So I've got a really good bus driver that I've got a good relationship with and he allows me to cancel at the last minute and book at the last minute.
8. Yeah. So you develop those ties after a while.
9. So that you can do it.
10. It's not easy but you develop those strategies for dealing with that because you know it might happen.

Example 21

1. And, and most of the time, um, we've, we've changed our field study program now so that we have flexibility to go when the weather's nice.
2. Because it seems to be *very* important.
3. When you go on those freezing cold days, unless you have a real keen class like that IB class I had, that would go in any weather if you take a bunch of kids that kind of, don't wanna go in the first place, out into wet, snowy weather they're not going to like nature. [Laughs]
4. Unless it's nice out, right?
5. And so we, we make an effort to have several kind of rain-out days so that if it's not nice, we don't go anymore.

Furthermore, from the above descriptions, Shiera's language makes bad weather relevant to students having a negative experience: "we always cancel if the weather is really rotten just because students do not have a positive experience" (Example 20, lines 3-4). The notion of cancelling outdoor activities during bad weather is supported through lexical cohesion. For example, Shiera expressed this sentiment in four different ways: "we make an effort to have several kind of rain-out days so that if it's not nice, we don't go anymore" (Example 21, line 5); "If it's miserable out we don't go" (Example 20, line 2); "we always cancel if the weather is really rotten" (Example 20, line 3); "if it rains, you just go on the next date" (Example 20, line 6). These different phrases represent the importance of avoiding bad weather so that students will not have a negative experience, that may lead to a negative view of nature. Shiera also uses relevance to connect bad weather with students not liking nature: "if you take a bunch of kids that kind of, don't wanna go in the first place, out into wet, snowy weather they're not going to like nature" (Example 21, line 3). These examples demonstrate that Shiera plans for a positive

outdoor experience by eliminating factors that may lead to a negative experience and possibly a negative outlook towards nature.

In contrast, Shiera connects good weather to students liking nature. In Example 21, she describes that students who go outside during bad weather will not like nature (line 3). Her next line adds an exception to the circumstances, "Unless it's nice out, right?" The significance of "unless" makes relevant that students can like nature if it is good weather and this may contribute to a positive outdoor experience. Shiera tried to maximize the chances of attending outdoor activities during good weather by having flexible dates (Example 21, lines 1-2). She notes nice weather as an important factor during an outdoor activity, "we've changed our field study program now so that we have flexibility to go when the weather's nice because it seems to be *very* important" (Example 21, lines 1-2). The word "because" makes nice weather relevant by citing it as an important factor for conducting an outdoor activity while the determiner "very" stresses the importance of nice weather. The notion of flexible dates is further described as having multiple dates on one permission form so that if the weather is bad on the first date, other dates are available (Example 20, lines 5-6). This strategy of multiple dates represents the degree to which Shiera considers and values good weather as a contributing factor towards a positive outdoor experience for students. Another support was the way she connected student enjoyment with planning outdoor activities (see below),

Example 22

1. Oh, it's *huuuuge*.
2. Yeah, it's huge.
3. I mean, we're still working on field studies.
4. Every year we tweak them a little bit more.
5. Because everywhere here, we say, 'ok, those kids didn't like that,' or 'this was dumb, and they didn't learn anything,' or 'we won't do that again because such and such a thing happened.'

6. You know, every year we tweak them, and I've been doing this for a long time and we still haven't found the perfect field study.
7. But, but, absolutely, not just student enjoyment but student ability to do it.
8. Because it's surprising how lost they get so quickly, like you give them a little instruction sheet and it seems very straightforward to you, "Put a drop of this in there, a drop of that, then mix them together and then look at this thing," right?
9. And you think it's very straightforward.
10. But when they try to do it out in the bush all by themselves, they get all confused.
11. And you can't be at 6 places all at the same time.
12. You can only run so fast through those bushes, right?
13. So, so you'll come upon them 3/4 an hour later, and they're sitting there, and they don't know what to do, and they've been sitting there for 3/4 of an hour, right?
14. So you have, so it's important that they know what to do.
15. Otherwise they just feel lost and they don't like it and they don't feel like they're getting anything done.

The importance of student enjoyment is emphasized with the determiner "huge" (Example 22, lines 1-2). Additionally, repeating "huge" twice, implies the importance of student enjoyment. Similarly, repeating "tweak" twice (Example 22, lines 4-6) emphasizes the connection between modifying field studies and student enjoyment. These examples show that student enjoyment was an important consideration when planning outdoor activities, demonstrating that Shiera ultimately wanted the students to have a positive experience.

Student preparation is another factor that Shiera considered when planning outdoor activities for a positive experience. She connects student preparation with enjoyment towards the outdoor activity: "it's important that they know what to do otherwise they just feel lost and they don't like it and they don't feel like they're getting anything done" (Example 22, lines 14-15). The word "otherwise" contrasts the connection between students' feelings when they have and do not have the preparation to complete the activity, as shown in the following topic chains:

overall topic chain: student ability → feeling towards outdoor activity
students do not know what to do (lacking ability) → feel lost → do not like activity → do not feel as if anything is getting accomplished

students know what to do (having ability) → feeling confident → like activity → feel as if something is getting accomplished

The above topic chains demonstrate that Shiera connects lack of preparation to complete the outdoor activity with negative feelings and having the preparation to complete the outdoor activity with positive feelings. This was further supported by the following example,

Example 23

1. And that's why we really started doing student-designed, part of the reason why we started doing student-designed labs because they take off with it then.
2. It's their lab, they know what they're doing cuz they designed it.
3. And then they kind of take off with that.
4. But with that said, you have to make sure that you cover things.
5. So we'll have a section on water testing, they have to do some kind of water testing, they figure out what they're gonna do. Right?
6. And they have a section on survey, so they do some kind of survey, and we have another section on, kind of, there's a range of things they can do that covers the program of studies, right?
7. So they, so they have to do at least 3 things, which takes them quite a bit of time.
8. They're their 3 things.
9. Like I talked about last time the, with the group that did the pictures of the wildflowers.
10. I mean, they were *beautiful,* and this was the end of the season when there are hardly any flowers left.
11. You know, they did get lost in the bush for quite a period of time [laughs].
12. But they came back with these pictures.
13. And it was really well done and those are 2 of my weakest students.

The connection between preparation and positive feelings is supported when she describes her motivation for students designing their own investigations: "part of the reason why we started doing student-designed labs because they take off with it then. It's their lab, they know what they're doing cuz they designed it. And then they kind of take off with that" (Example 23, lines 1-3). The word "because" is a connection to show that students were better able to complete their self-designed labs. Student preparation is represented by the phrase "take off," and its repetition emphasizes the facility that students were able to complete their own investigations.

This is further supported by Shiera describing "weak" students as being able to successfully complete their investigation: "it was really well done and those are 2 of my weakest students" (Example 23, line 13). Shiera's link between student preparation with positive feelings and their effect on completion of outdoor investigations shows that student preparation helps connect the outdoors with positive experiences.

Shiera's language also connects the outdoors to bonding with students, which is clear from her statement, "it's a real bonding experience with the class" (Example 19, line 6). The pronoun "it" refers to an earlier part of her statement where she discussed experiencing nature (Example 19, line 2) and if that reference is substituted into the sentence it would look like "[experiencing nature] is a real bonding experience with the class." This shows that Shiera connected the outdoors (experiencing nature) to bonding with students. She uses the quantifier "real" to describe the kind of bonding that occurs. She also connects the speed of bonding with students to when the outdoor activity occurs, such as at the start of term, "Especially when you do [an outdoor activity] in September when you're just starting out with a class. I usually develop a relationship very quickly with those students" (Example 19, lines 7-8). The emphatics "especially" and "very" stress how quickly a bond develops with students through experiencing nature. Because these emphatics are lexically cohesive to one another, their multiple usages further stress the speed of that bond development.

For Shiera, a bond based on shared outdoor experiences with students is "real" rather than other kinds of bonds, "it's a different kind of relationship than you have when they're sitting in a desk" (Example 19, line 9). This statement shows disconnect between the kind of relationships based on indoor experiences and those based on outdoor experiences, as can be seen by the following re-wording of her statement: "relationships with students based on

174

experiencing nature are different than the relationships with students based on experiencing the indoor classroom." Shiera explains that "different" means non-academic conversations allowing her and her students to get to know one another on a more personal level: "this last time we went out, we all sat around and ate lunch together… we just talked about stuff and it's got nothing to do with ecology either… it's got nothing to do with the, with what you're doing but it's that relationship…they get to know you on a little different level" (Example 19, lines 10-13). Topically these examples demonstrate the ways that the outdoors were connected to bonding with students:

> experiencing nature (outdoors) → bonding with students → real bond → fast development (especially at start of term) → different bond (than indoor experiences) → more personal

Initially she connects the outdoors to bonding with students and then makes that bond relevant to the start of term by saying that timing can act as a catalyst for relationship building then she contrasts that to a relationship based on indoor experiences

The outdoors is connected to Shiera's teaching both as a teaching tool and a teaching philosophy. As a teaching tool, the outdoors is a novel experience, "It's very much a tool because it's something different that kids can enjoy because it's different and it's fun to go outside and do something different and, you know" (Example 28, line 2). The connection between the outdoors and a teaching tool was made relevant through "because" that demonstrates her reasons for their connection: enjoyable, fun, unique experience. Repetition of the word "different" emphasizes the outdoors as a novelty when (presumably) compared to indoor classroom experiences. In this way, Shiera's view of a teaching tool is something that is shallow since her description of the use of outdoors stresses novelty rather than a deep pedagogical reason. This is in stark contrast to her connection of the outdoors as a teaching philosophy: "it's also a part of

my philosophy that you have to have a big picture when you're studying science. And one of the biggest pictures is, nature is amazing…how can you know nature is amazing unless you go in nature…You can't know that unless you have some kind of experience with it" (Example 28, lines 3-6). When Shiera said that her teaching philosophy includes a big picture when studying science, she connects that a big picture is mandatory as indicated by the phrase "have to" (Example 28, line 3). She then connects that big picture using "and" to the concept that nature is amazing. The word "unless" was used to indicate that the only way of knowing that nature is amazing is by experiencing nature (the outdoors). Repetition of the phrase "nature is amazing" emphasizes her positive outlook for the outdoors. As a topic chain, Shiera makes the following connections:

teaching philosophy → big picture → nature is amazing → outdoor experience

Each of these examples demonstrate that Shiera connects the outdoors to her teaching both as a teaching tool (when including the outdoors as a novelty to break up classroom routine) and as a teaching philosophy (when using the outdoors as a way of knowing nature is amazing and this is the big picture of science).

Overall, Shiera connects the outdoors to several different areas. The outdoors is connected to taking care of nature by first making the connection between experiencing nature with being outdoors and then connecting experiencing nature with appreciating nature to taking care of nature. She also connects the outdoors with a positive experience by connecting positive feelings to outdoor experiences, and by planning. Shiera planned outdoor activities with the goal of creating a positive experience for students (this was done with flexible dates so that she can choose to go during good weather), tweaking field studies to account for student enjoyment, and considering student ability by incorporating student-designed investigations. The outdoors was

also connected to bonding with students by making the outdoors relevant to relationship building, the speed of developing that relationship, and the quality of that relationship. Lastly, the outdoors is connected to teaching as both a novelty and philosophical tool for studying science.

6.4 Social Language Tool and Doing, Not Just Saying Tool, and Situated Meaning Tool

Shiera's value for the outdoors, students, and other teaching methods is demonstrated by The Doing, Not Just Saying Tool and The Social Language Tool. The Doing, Not Just Saying Tool helped clarify the way that her teaching practice was representative of her values (as indicated by descriptions of her teaching experiences). The Social Language Tool illustrated the type of language Shiera engages in to portray her as a particular kind of teacher. Together, these tools compare the social language she engages in with the self-descriptions of her teaching practice. Her descriptions of the outdoors while teaching, for instance, use certain words and phrases that "co-locate" with one another to indicate utilization and value of the outdoors (see the following examples)

Example 24
(Shiera was asked why she decided to use a field study as an activity.)

1. Um, well, the **field study** is required curriculum.
2. Well, we make a **bigger deal out of it than most**.

Example 25
(Shiera was asked to explain the way in which she makes the field study a big deal.)

1. I mean we make it a **major part of the course**.
2. We **spend a lot of time on it**.
3. We always go out to a **natural area**, we don't just go to our own parking lot or whatever.
4. And, and we make students plan their own investigations.
5. So that takes a considerable amount of time and work. Right?
6. And we spend anywhere from half a day to a full day on the **field study** depending on the weather, the students, and how course schedules work.

Example 26
(Shiera describes her most recent field study.)

1. Yeah. The last time we went was last semester and we do it right at the beginning of the year before we even know our students because of the weather, right?
2. So we start in September and we go right as soon as we can.
3. And we went to a place called **"Strathcona Wilderness Center"** because they have a **really nice pond** out there that has an outhouse close by, it has a **nice clean trails** there so students can get access to the **forest**, and it has a boat that you can actually put a little dinghy boat into and a lot of ponds you can't walk up easily to because you have a lot of muskeg in between and you get really stuck, and this one's good.
4. So we went there, and we spent, uh well the morning and the noon hour so from 9 am til 1230 out there.
5. And the students designed their own investigations.
6. They had to design one investigation that involved population counting exercise.
7. One investigation that involved water testing or soil testing, either one, some kind of chemical testing.
8. And one part that was a survey, surveying **plants or bugs**.
9. It was a three part.
10. So they designed each of the three parts in groups.
11. Well, we had beautiful weather, the kids were really great, I kind of got to know them that day.
12. We had a lot of crazy characters and so we had a lot of fun.

Example 27
(Shiera explains characteristics of student behavior that represented their interest while learning outside.)

1. You know what, I don't know if their grades were better and I don't know if their questions were more in-depth but what they did, they had personal interest in. Right?
2. So if they liked **flowers**, they did **flowers**.
3. So if they liked **bugs**, they did **bugs**.
4. If they wanted to go **sail in the boat**, they **sailed in the boat**.
5. And so I think for the most part they enjoyed it more.
6. I don't know if their marks were better because it's very difficult to plan your own study and do it and present something that makes sense right at the beginning of a course before you learn anything about science, really.
7. All they have is Science 10.
8. So they have a hard time doing it and in some cases I was disappointed with the results because they, they would just slap something together, slap it up there and say, 'that's science' and it really wasn't, you know?

9. Cuz they didn't have any idea of the expectations.
10. So I, I would love to put it right at the middle of the course right when they know me, I don't have to wait right til the end but at least give it a month or so a month and a half, so they can get to know me and what I expect from a self-planned investigation.
11. But in the case of Alberta, right?
12. If you don't go out in September, then you don't really go out.
13. I mean, I've done **winter ecology studies** before but found that they were very difficult, the weather was unpredictable, and the students didn't like being cold, so I'll never do it again.
14. I did it once and I never did it again.

The various bold-type words and phrases represent a collocational pattern that emphasizes natural settings: field study, natural area, Strathcona Wilderness Center, forest, plants or bugs, flowers, and bugs. The words field study, flowers, and bugs are all repeated twice, and this demonstrates support for natural settings. Other words and phrases indicated use of the natural outdoors, including nice clean trails, really nice pond, and winter ecology studies. When these words and phrases are combined with other phrases, such as "bigger deal out of [a field study] than most," "[field study is] major part of the course," and "spend a lot of time on [the field study]," they cumulatively evoke a value for incorporating the experience of natural settings while teaching biology.

The Doing, Not Just Saying Tool reified Shiera's value for the outdoors by revealing that her language prioritizes the incorporation of outdoor experiences. Since she brings her students outdoors at the beginning of the course before the weather turns, they have not had the chance to further their learning about science and must rely on their background knowledge. In addition, the students have not had the chance to familiarize themselves with Shiera's expectations of a field study investigation. This concept is shown in the following examples: we do it right at the beginning of the year before we even know our students because of the weather (Example 26, line 1); we start in September and we go right as soon as we can (Example 26, line 2); what they

did, they had personal interest in (Example 27, line 1); it's very difficult to plan your own study and do it and present something that makes sense right at the beginning of a course before you learn anything about science (Example 27, line 6); all they have is Science 10 (Example 27, line 7); they have a hard time doing it (Example 27, line 8); they didn't have any idea of the expectations (Example 27, line 9); what I expect from a self-planned investigation (Example 27, line 10); in the case of Alberta (Example 27, line 11); if you don't go out in September then you don't really go out (Example 27, line 12). This indicates that outdoor experiences during ideal weather conditions are more important to Shiera than her students' full preparation for a field study investigation.

Results from The Social Languages Tool demonstrate the way Shiera values students. The collocational pattern in Shiera's social language portrays her efforts to maximize student enjoyment in various ways when planning outdoor activities. For example, she notices that students took personal interest in the field studies they designed, and they seemed to enjoy these field studies more than other labs (that they presumably did not design) (Example 25, line 4; Example 27, lines 1 and 5). This motivated Shiera to continue using student-designed field studies (described earlier). As discussed previously, Shiera also tried to ensure good weather conditions so that students would enjoy the field study. Within the context of Alberta weather, she mentioned that students were brought outdoors at the beginning of the course prior to the onset of winter (Example 25, line 6; Example 26, lines 1-2; Example 27, lines 11-12). As a comparison, she explains why she avoids winter by recalling a winter ecology study where the weather was unpredictable, and the students did not enjoy the activity (Example 27, line 13).

Other than weather, Shiera also considers the amenities of the outdoor location when planning student activities. Part of why she chose the Strathcona Wilderness Centre, for example,

was for its amenities: easy access to water via a pond, an outhouse nearby, and access to the forest via trails (Example 26, line 3). Shiera's consideration of student interest, weather conditions, and amenities cumulatively form a collocation pattern that seems to indicate her efforts to maximize student enjoyment via students' personal interest (in their self-designed field study), pleasant weather conditions, and readily available amenities. The Doing, Not Just Saying Tool further confirms that Shiera may have been trying to provide a positive outdoor experience for students, so they can enjoy and possibly have greater appreciation for natural settings. This suggests her social identity as the kind of teacher who values enjoyable learning experiences for students.

Shiera's value for students is also demonstrated by her encouragement of their independence and is best exemplified by her emphasis upon students designing their own field study. The Cohesion Tool reveals that her language asserts this notion by repeating three times students' self-designed investigations (Example 25, line 4; Example 26, line 5; Example 27, line 6). When this assertion is combined with the field study as "a major part of the course" (Example 25, line 1), and Shiera stressing the field study more than other teachers, a collocational pattern emerges suggesting that an important part of Shiera's course is for students to work on their self-designed study. Further support that Shiera prioritizes furthering student independence with their learning is shown through The Doing, Not Just Saying Tool, which indicates that students become independent and active learners. The parameters of the investigations, for instance, involved chemical testing and a survey of flora or insects (Example 26, lines 6-10) has students actively interacting with the environment in a scientific manner. Because these field studies are self-designed, the students understand each step of their scientific investigation and why that particular step is necessary. This understanding may contribute

towards their independence in learning. The collocational pattern and the Doing, Not Just Saying Tool collectively portray Shiera engaging in the social language of the kind of biology teacher who emphasizes active and independent learning and values these characteristics in her students.

Shiera's social language was also indicative of her value towards other teaching methods. Teaching is mostly solitary in that there is one teacher for a classroom full of students, but when Shiera conducts the outdoor field studies she describes inclusion of other teachers and classes. The Deixis grammatical tool reveals that she uses the word "we" to refer to herself and the other teachers (Examples 24-27) that may indicate a view of the other teachers as equals. This is further emphasized through repetition, including repeating "we" seven times (Examples 24-25), suggesting that Shiera considers herself and the other teachers as a collective. Additionally, Shiera does not refer to the other teachers from a hierarchical view, such as using the phrase "my teachers," although she is their department head. The Doing, Not Just Saying Tool shows that teaching is not routinized in the following ways: teaching is not solitary (by describing the involvement of other teachers and classes with the field study), teachers are treated equally, students can design their own investigations (as opposed to following instructions from the teacher or text book), and some activities may be a greater part of the course than others. Her language also demonstrates a willingness to try other teaching methods such as the winter ecology study. These results portray Shiera's social identity as the kind of biology teacher who is non-routinized by including other teachers.

Overall, Shiera's social language portrays her as the kind of biology teacher who values the outdoors, students, and other teaching methods. This is mainly indicated through collocational patterns and supported by The Doing, Not Just Saying Tool. Her value for the

outdoors, for example, was represented through her language by emphasizing natural settings such as the field study as a major component of the course. Her description of the different factors involved with planning an outdoor activity shows how she values students since she tries to maximize their enjoyment through personal interest (by designing and completing their own investigations), amenable weather, and nearby amenities. Shiera also expresses a value for new teaching methods by trying the winter field study. As a whole, Shiera's social language portrays her social identity as the kind of biology teacher who values natural settings, student enjoyment of their learning, her students becoming independent learners, and other ways of teaching.

6.5 The Figured Worlds Tool

A figured world is a simplified model for a "standard," or what is construed to be "normal" or "usual" according to a specific social or cultural group in order to understand the world (Gee, 2011b). Additionally, he adds that The Figured Worlds Tool examines how language assumes what is "typical" in values, activities, assumptions, members, and interactions; the tool also considers how the speaker conveys what is "typical," what role the speaker assumes the listener to have, and other characteristics. Gee (2011b) further includes that because the teaching landscape is ever changing with new students, new staff, and other unstable factors, figured worlds are not fixed in teaching, and are subject to change. This section will explore Shiera`s figured world.

The figured worlds that comprise Shiera's teaching are the outdoors and relationships. There are a few aspects to Shiera's figured world of the outdoors. One aspect is experiencing nature and for Shiera, that experience only occurs in natural settings (Example 19, lines 1-4). This was emphasized by Shiera's language since a vast majority of her descriptions regarding

outdoor experiences took place at natural settings. The more experiences in nature Shiera had, the greater her positivity towards nature.

This positivity may contribute towards her value of the environment, which was another aspect of her outdoors figured world. Her value seems to show that part of her figured world includes a belief system that respects and wants to maintain the environment for the long-term (Example 15). Her value may be partly based on her teaching experience since her focus is on influencing students to be future stewards and in contrast, other teachers may have a different view of their students in the future.

One more aspect to Shiera's figured world is from a pedagogical view—the outdoors with respect to teaching. In this view, the outdoors is a part of her biology teaching as both a teaching tool and a teaching philosophy, which also indicates that there may be a multitude of teaching tools and philosophies to choose from (see the following example),

Example 28

1. Yes [laughs]. I'd say it's both.
2. It's very much a tool because it's something different that kids can enjoy because it's different and it's fun to go outside and do something different and, you know.
3. But it's also a part of my philosophy that you have to have a big picture when you're studying science.
4. And one of the biggest pictures is, nature is amazing, right?
5. And how can you know nature is amazing unless you go in nature? Right?
6. You can't know that unless you have some kind of experience with it.
7. So that's why the weather's gotta be nice too.
8. Because if it's not amazing, then it's just not, it's just not getting the right idea across.

In this aspect, Shiera saw the outdoors as a tool for teaching curriculum content and as a way for students to know that nature is amazing, and these aspects also demonstrate the outdoors integrated with teaching instead of being separate.

The aspects of experiencing nature, maintaining the environment, and the pedagogical view of the outdoors all contribute to Shiera's figured world of the outdoors. Her language positions the listener to agree with her by using rhetorical questioning (Example 19, lines 3-4; Example 15, lines 4-5, and 8; Example 18, lines 3-4). For Shiera, her figured world of the outdoors is an immersive natural environment that needs long-term care, which can be accomplished through education.

Another figured world is the relationship between teachers and students where they get to know each other on a personal level from shared outdoor experiences. In this figured world it is acceptable for teachers and students to speak about non-academic matters, such as those of a personal nature. Shiera's figured world of the relationship between teachers and students may be based on her experience with her teachers (as a student) and her years of teaching experience. She saw getting to know students as a way of developing trust so that they may be more amenable to other teaching methods she may want to try. To imagine Shiera's Figured World, it may look like students designing their own field course at the beginning of the term, despite their level of preparation. This field course would be a major part of the course and would take place in a natural outdoor setting during fair weather conditions. Shiera would spend time getting to know her students on a personal level during lunch. This field study and the associated personal conversations could set the tone for the teacher-student dynamic for the rest of the term. Their relationship would be based on their shared outdoor experiences and in turn, they would have personal anecdotes unique to that class. These relationships could contribute to an interactive and trusting learning atmosphere that may help students be more willing towards Shiera's use of different teaching methods. Shiera may present herself as a knowledgeable, confident, and personable high school biology teacher.

185

Together, these figured worlds provide a glimpse into the way her language portrays what is common in Shiera's teaching, such as valuing the environment and relationships with students. For Shiera, the outdoors in her figured world is the natural environment. Her language represented her as valuing the environment through experience and appreciation. From a pedagogical perspective, her language also illustrated the outdoors as a foundation for developing student relationships, and a setting where students can further their own appreciation and may become future stewards. Because these figured worlds are shown from her language, they are specific to her teaching and may not necessarily be shared or supported by other biology teachers.

6.6 Case Summary: Shiera

Shiera's discourse represents her as the kind of teacher with particular teacher traits, teaching goals, and values towards the outdoors.

The discourse tools suggest that Shiera has certain teacher characteristics, of which one is teaching confidence. Her language indicates that teaching confidence was a significant aspect of her teaching. Teaching confidence affected students in that they were more assured by a teacher who exhibited confidence and teaching accountability, particularly in high accountability situations, and teaching ability. This was supported by findings from The Activities and Identities Building Tool and from various micro tools including topic chains, lexical cohesion, and rhetorical devices. A flexible teaching style (unroutinized) is another teacher characteristic represented through Shiera's language via The Activities - Identities Building Tool and micro tools such as cohesion and topic chaining. The Social Languages Tool indicates through collocational patterns that she is willing to try different seasons for the field study, and that

shows flexibility in the way that investigation is conducted. The Connections Building Tool also showed flexibility by portraying her as trying different teaching methods such as using the outdoors as a teaching tool. A final teacher characteristic was her effort in building relationships with students, and that was illustrated through her language in several ways. The Connections Building Tool showed that she linked the outdoors to building relationships with students while The Figured Worlds Tool portrayed this type of bonding, getting to know students on a personal level during an outdoor activity, as one of Shiera's typical traits.

In addition to revealing Shiera's teaching characteristics, her language also illustrates her teaching goals. All of Shiera's goals are future-oriented, as they are values that she wants to instill in her students for long-term effects. Results from The Figured Worlds Tool and The Social Languages Tool suggest that it was typical for her to provide opportunities for student voice. This is exemplified from the way she describes students designing and completing their own investigations: students have greater interest and independence in their learning and have a sense of accomplishment. Another goal was for her students to be "good people," which was shown through descriptors and quantifiers (as revealed by The Significance Building Tool) and supported through grammar tools, including The Cohesion Tool and The Topic Flow or Topic Chaining Tool. A third goal of Shiera's is for students to have a positive view of nature, which was represented in her language in several ways, including the way she plans outdoor activities. Her planning reveals a collocational pattern (via The Social Languages Tool), indicative of her efforts to maximize student enjoyment via personal interest, favourable weather, and local amenities. This was supported by The Connections Building Tool, which showed a linguistic link between outdoor activity planning and creating a positive experience for students. Further support was from The Figured Worlds Tool that showed Shiera's strategy of ensuring good

weather, including putting a range of dates available on the outdoor activity permission forms so they may cancel if there is bad weather. These discourse tools represent her desire to conduct outdoor activities during ideal conditions that may influence students to develop a positive view of nature, and these complement her value for the outdoors.

Shiera's language represents her value for the outdoors. The Connections Building Tool linguistically connects the outdoors to positive feelings and experiencing nature with appreciation and stewardship. These connections are supported by The Social Languages Tool by emphasizing natural settings through her description of the field study. Finally, The Significance Building Tool shows that through descriptors, quantifiers, and grammatical tools, the value of caring for the natural world is a significant aspect in her language.

Overall, Shiera's language represents her as the kind of teacher who is confident, flexible with her teaching style, and values relationships with students. She is also portrayed as a teacher who cares for the future in her desire for students to be active, independent learners, "good people," and to value the environment. Her language illustrates her value for the outdoors, including caring for the natural world, and having a positive view of nature.

Chapter 7

Case: Hal

7.1 The Significance Building Tool

Hal's description of his views and experiences with the outdoors reveals that his

academic and pedagogical values towards the outdoors are significant aspects of his language.

His reflections on his outdoor experiences emphasize an academic view. Consider Example 29

Example 29

1. And in terms of outdoor education, I think that some of the best courses that I took in my science undergraduate were courses that went out to Banff field on the west coast and studied invertebrates.
2. You know when you're outdoors and you're doing that kind of stuff and I mean especially biology, biology doesn't only happen in a classroom, most of it's happening outside around us.
3. So that was certainly something that I wanted to incorporate into my teaching, I knew.

His use of the adjective "best" (line 3) represents something of highest quality or outstanding,

and its use increases the significance of those courses. Because "best" refers to science courses,

his language makes significant the academic value of the outdoors. His language is exclusively

focused on the outdoors, as the following topic chain shows (words connecting the topic are

capitalized):

outdoor education → some of the best courses from science undergraduate were field courses → when you're OUTDOORS → AND → doing THAT kind of stuff → AND → especially biology → BIOLOGY doesn't only happen in a classroom → most of IT happens outside → THAT was something I knew I wanted to incorporate into my teaching

This topic chain indicates that Hal's language emphasizes an academic view of the outdoors as a

setting for learning. The phrase "especially biology" (line 2) further supports this notion by

setting up a comparison against other field courses such as chemistry or physics courses. Use of

the adverb "especially" signifies the importance of the relationship between learning biology and

189

the outside environment. Emphasis on the outdoors is evident in several discursive ways, including lexical cohesion that shows four different references to the outdoors: outdoor (line 1), Banff field (line 1), outdoors (line 2), and outside (line 2).

In addition to an academic view, Hal's language makes his pedagogical value for the outdoors significant. For example, the phrase "I knew" (line 3) demonstrates certainty and increasing confidence in his conviction to include the outdoors in teaching. The Significance Building Tool shows that Hal's language makes significant his value for the outdoors as a setting for students to develop their view of science in several ways, and The Cohesion Tool, including lexical cohesion, supports it. Consider the following example:

Example 30

1. In an ideal world?
2. I would love for them to have a deeper appreciation of science.
3. And to recognize that science is everywhere, all around us.
4. And I mean, my wife has a Ph.D. in literature and English and we see things so very differently.
5. Like, I just dropped them off at the art gallery, right?
6. And they have this Piet Mondrian painting there, which I love Mondrian.
7. And we were talking about the intersecting lines that are on this painting, and how when you look at them, your rods and cones get confused and they see little dots in the intersecting lines that aren't really there.
8. So like, I see that science stuff everywhere, even in art.
9. If you could get students to start finding their own connections between science and their everyday lives, then that to me is the ultimate goal.
10. Who cares about learning the parts of the heart?
11. Like I'll teach them it.
12. I'll teach it to them in a fun way.
13. But they can look that up too.
14. But if they're actually excited about it then that's even a better goal.

Hal's value for the outdoors as a setting for the students to develop their view of science was shown in several ways with The Significance Building Tool and The Cohesion Tool (includes lexical cohesion). Hal uses the emphatics "love" and "deeper" (line 2) to highlight that he wants

190

his students to appreciate science. His language makes significant the phrase "science is everywhere "by repeating the word "everywhere" in three different ways: everywhere (lines 3 and 8), all around us (line 3), and everyday lives (line 9).

Hal's language also makes significant the outdoors as a setting where students can get excited about learning. Consider the following topic chain rendered from the example above (words linking the topics are capitalized):

> love for students to have a deeper appreciation of science → AND → recognize science is everywhere → AND → that science stuff is everywhere → if students find connections between science and their EVERYDAY LIVES → THAT is the ultimate goal → if students are excited about learning → THAT is a better goal

The topic chain clarifies Hal's goals for students, such as a deeper appreciation of science, recognizing that science is everywhere, finding connections between science and their everyday lives, and excitement about learning. Hal considers some goals more important than others, as can be seen by the phrases "ultimate goal" (line 9, when referring to students connecting their experiences to science) and "better [than ultimate] goal" (line 14, when referring to students being excited about learning).

Overall, Hal values the outdoors academically and pedagogically as indicated by The Significance Building Tool. Through word choice and phrasing, Hal's language makes significant the outdoors as an academic setting and as having pedagogical value. These results from The Significance Building Tool are supported by The Cohesion Tool (that includes lexical cohesion and repetition).

7.2 The Activities - Identities Building Tool

For Hal, teaching science guides students to make connections with the outdoors. This is evident in several of the outdoor investigations he uses, including natural selection and secondary succession (see the corresponding descriptions below):

Example 31

1. Yeah, for that course [Science 20], one of the things that I always do is uh for natural selection, I, I'll show you a picture.
2. Um, I give them, I tell them they're predators and they're outside and they're gonna look for prey.
3. And the prey that I give them is coloured toothpicks.
4. And what they do with it is, I have a timer, they go out onto the lawn wherever here and they have to collect as many prey as possible and so the coloured toothpicks— there's green, blue, yellow and red, right?
5. When you buy the bottle of it.
6. So, like those kind of toothpicks.
7. So I sprinkle them outside here and I count them out first and I have them go, and they collect as many as they can and then they, we come back in and we count them.
8. And then we talk about well, why is it that we almost found all the yellow and red ones, but we found very few of the green ones and a couple of the blue ones, right?
9. So that whole idea of, you know, blending in to your surroundings.
10. So that would be like a quick thing where we'd go outside to do something like that.
11. Or, what I've done for their succession, again, harder in this community, for secondary succession I had them do a photo scavenger hunt.

Example 32

1. Yeah, like [name of former school] was in an industrial area and it's an older school and like older buildings around, right?
2. So, any evidence of secondary succession then would be where you've got plants growing through cracks in the ground or maybe you've got some moss growing on a wall, like that kind of stuff, you know?
3. Like, looking for where you'd start to see, and I start that out by saying like "let's imagine that humans stepped away from Edmonton for a hundred years, what would that look like?
4. Let's go outside and see some evidence of what that, cuz plants are always opportunistic and find a place where they can kind of start to grow.
5. Let's try and find a place where we can see some evidence of that starting to happen."

6. And they already know the answer of what things might look like or they have some idea anyways of what things may look like a hundred years from now if we abandon some place, so I use that to sort of set the stage.
7. And then, I'm always surprised at the things that they can find.

In each investigation Hal is recognized as a biology teacher since he introduces the lesson, provides instruction, and has a follow-up discussion. In the first investigation for example, he starts the lesson with a picture and tells students to pretend they are predators who must look for prey outside, and after collecting their "prey," Hal leads a discussion about natural selection. In the following investigation Hal introduces the lesson by having students imagine the city without humans for a century, instructs and has a follow-up discussion about secondary succession. These investigations depict teaching as an activity with social significance because Hal is socially recognized as a biology teacher. Hal's teaching intends for students to connect theory with the outdoors. He includes investigations in his teaching so that students may make connections on their own. For example, he plans for his students to investigate how natural selection would favour camouflage (Example 31) and the characteristics of secondary succession (Example 32) so that the students may develop a scientific view of their neighbourhood.

The design of these investigations suggests that Hal is the kind of biology teacher who guides students to make their own connections between science and the outdoors. This is best exemplified through positioning. Hal's language positions the students as novices through the use of rhetorical questioning (Example 31 line 8) and provision of clues (Example 32 line 3) to guide their learning. If the students are novices, then Hal's language positions him as the expert and guide for their learning. These investigative teaching methods engage students with the environment: to learn about natural selection (Example 31) students must interact with the environment to find prey; to learn secondary succession (Example 32) they observe their

immediate environment differently. The design of these participatory investigations suggests that Hal values students' engagement with the environment.

Together, The Activities and Identities Building Tool portray Hal as a guide for students who learn to make their own connections between science and the outdoors. The nature of Hal's teaching and the design of his investigations results in students connecting theories such as natural selection and secondary succession to the outdoors. Hal uses rhetorical questioning and provision of clues to position students as novices and guide them to draw their own conclusions. Hal's practice of guiding and directing student learning suggests that he values students drawing their own conclusions.

7.3 The Connections Building Tool

Hal's language uses various methods to connect the outdoors as a setting for students to develop a scientific perspective to understand their everyday experiences. The Connections Building Tool shows that Hal's language connects the outdoors with students' scientific understanding of their everyday experiences. This complements results from The Significance Building Tool indicating that the phrase "science is everywhere" is significant in his language because he connects the phrase to several areas. For instance, consider Hal's description below:

> Example 33
> (Researcher asks Hal if the outdoors is the best way to show that science is everywhere.)
>
> 1. I think it's one way to showcase them.
> 2. Uh, one way that, another way that I try to showcase that connection is trying to read the paper every day, every morning, and from the courses that I teach, I can almost always pick out an article that's in the paper that day and relate it to something that we've studied in one of the courses.
> 3. So I usually try and bring that in to show the kids that like, 'Hey! we're talking about genes that maybe influence cardiovascular disease.
> 4. Here's a discovery that they made about that!'

194

5. Talking about this in class yesterday, here it is in the paper today'.
6. Like and that happens so often um, it's very serendipitous, it just, it seems to really work out, and partly 'cause I'm looking for it.
7. But partly 'cause it's the truth: that what we're studying does relate to the real world.
8. So that certainly is a connection, I mean, this kind of stuff and how, like, I teach about evolution in two of my classes.
9. In biology and in Science 20 and having these photos of students who are my students and showing them in the Galapagos next to a giant tortoise is way more meaningful, even if the kids haven't been there they are much more engaged and interested in it.
10. Especially when I was still at Wagner and I could say, 'Hey here's Daniel, last year who you, lots of you know on the Galapagos.
11. This is a real place.
12. Here's how cool it is.
13. Here's how it inspired Darwin, here's why.'
14. Oh, even when I showed them this year, to this class, talking different school, how many years ago and I show them photos of me in the Galapagos and the kids there it's way more meaningful to them and I think they are better able to engage with it and that they're better able to understand it.

From the description above Hal connects science to different areas. To clarify those connections to science, see the following topic chain (connecting words capitalized),

science is everywhere → OUTDOORS is one way to showcase that → ANOTHER WAY → bring in a newspaper article related to the lesson → what we're studying relates to the real world → THAT is a connection → I teach about evolution → showing pics of myself with students in the GALAPAGOS → more meaningful to STUDENTS and more engaged

The topic chain clarifies that Hal's description provides different examples of where science may be found. When he says, "science is everywhere," the word "everywhere" represents the range of locations where science may be found, such as the outdoors, newspaper articles, pictures of the environment in the Galapagos. Relevance is added through lexical cohesion by phrasing "science is everywhere" in several different ways: them (line 1); that connection (line 2); what we're studying does relate to the real world (line 7); that certainly is a connection (line 8). A further emphasis is the phrase "it's the truth" that likens "science is everywhere" to an indisputable fact. Certain wording and phrasing in Hal's language emphasizes a connection

between science and the different locations where it may be found. Another support for where science may be found is the following connections,

> science is everywhere → ways to showcase that → outdoors → find newspaper articles related to lesson → show pictures from when he brought students to Galapagos

These connections demonstrate a way of viewing science from everyday experiences. Through his language, Hal indirectly shows students that science is more than what is inside a traditional science classroom. Rather, experiencing the outdoors and specific places such as the Galapagos may be understood from a scientific perspective. One way that he suggests this to his students is through the newspaper articles relating to his teaching. Multiple phrasings (lexical cohesion) of the occurrence of relevant newspaper articles adds emphasis, including the phrases "every day" (line 2), "every morning" (line 2), and "almost always" (line 5). By connecting his lessons to newspaper articles on a nearly daily basis, Hal's language shows to his students the frequency with which science occurs. Additionally, this demonstrates the importance of newspapers with respect to where science can be found. Because Hal typically uses these articles as examples of science (lines 2-6), his language indirectly encourages students to consider their typical experiences through a scientific lens.

Hal's specific reference to his trip to the Galapagos further highlights to his students the connection between science and the world outside the classroom. By twice repeating "meaningful" and "student engagement" (both in lines 9 and 14) his language connects a pedagogical value with showing these pictures to students. Furthermore, The Connections Building Tool also shows that in addition to using the pictures as a tool to generate student interest, Hal's language connects and may influence students to consider these pictures and to listen about past experiences from a scientific viewpoint.

Hal's consideration of "science is everywhere" may also contribute to his view of the outdoors as a pedagogical setting. This is represented in the way he describes the outdoors as a classroom:

Example 34

1. I mean, I think we were talking about this before, it would be awesome to go and do one of those sailboat, I wanna sail around the world and teach the global outdoor classroom.
2. And that's real learning.
3. Like I can't wait to take my son to Banff field to go like play in the tide pools and you know, touch starfish and that kinda stuff because that's where you really get excited about science.
4. You might have a fantastic teacher in elementary and, and be excited about the topic of science, but the outdoors is where science happens.

From the above description, Hal's language makes the outdoors relevant as an educational setting (see the following topic chain with words linking topics capitalized),

global outdoor classroom → THAT is real learning → LIKE Banff field (ex. play in tide pools, touch starfish) → BECAUSE that's where you get excited about science → BUT the outdoors is where science happens

Since science occurs in the outdoors this can be a place where students can observe scientific processes. Additionally, the topic chain shows that Hal's language connects the outdoors with real learning. This is the kind of learning where students are enthusiastic and engaging with the environment or creatures. The use of "real" in "real learning" also indirectly differentiates between the kind of learning that happens outdoors against, presumably, the indoors. These examples demonstrate that Hal's language connects the outdoors with a scientifically pedagogical perspective. Hal's language also represents the outdoors as a classroom:

global outdoor classroom → real learning
Banff field → that's where you really get excited about science
the outdoors → is where science happens

197

These connections refer to science with respect to the outdoors. When combined, these connections create the following topic chain:

the outdoors → real learning, that's where you really get excited about science, is where science happens

The cumulative topic chain represents the way that Hal connects the outdoors with pedagogy. He also uses "really" to stress the pedagogical value of the outdoors: "real learning" (line 2), and "really excited about science" (line 3). The use of "really" also indirectly compares learning and excitement (about learning science) in different settings: excitement for learning occurs at "real" levels in the outdoors.

From The Connections Building Tool, Hal's language ultimately connects the outdoors with a setting for students to develop a scientific lens to understand the world. For instance, he connected his view of "science is everywhere" with the outdoors, newspaper articles, and a trip to the Galapagos. These examples demonstrate to students that everyday experiences and international locations can connect to science. Hal's language additionally connects the outdoors with real learning, a setting to get excited about science, and locations where science happens. Together, these connections depict the outdoors as an opportunity for students to apply their scientific knowledge and "see" science happening. When applying their scientific knowledge outside of the classroom, real learning occurs. Hal's linguistic connections with the outdoors portray him as the kind of teacher who encourages students to develop a scientific view of observing and understanding the world.

7.4 Social Language Tool and Doing, Not Just Saying Tool and Situated Meaning Tool

Hal's social language expresses an identity of a science teacher that may be characterized as valuing students learning independently in immersive learning environments. The Situated Meaning and Social Languages Tool reveals Hal's language depicts him in a certain way. For instance, consider the following words and phrases from Example 35 in Figured Worlds: chemistry labs (line 7), [chemistry] equation (line 7), practice worksheets (line 8), labs (line 9), classroom (line 10), students (lines 12 and 16), field study (line 12), and program of studies (line 12). These words and phrases co-locate in a particular way that represents Hal as an Alberta chemistry and/or biology teacher who incorporates labs and field studies into his teaching.

Hal's social language presents him as a science teacher and positions the listener as a fellow science teacher by describing that more time is needed to set up outdoor activities, and that the teacher is not in control. Additionally, use of the rhetorical question "right?" (lines 9 and 11) and "you" (line 9) treat the listener as someone familiar with setting up labs and outdoor activities for science classes. Hal's language also positions the listener as a science teacher by assuming that the listener understands the phrase "you're not in control" (line 9) from a pedagogical perspective for example while students work independently or in small groups, the teacher is not controlling each student since they are provided with class time to complete their investigation. The Fill In Tool recognizes this type of assumption by those familiar with science teaching and who have experience organizing and conducting labs.

Additionally, Hal's social language also portrays his value towards students learning independently. For example, he provides his students with opportunities to be guided by their curiosity, such as by letting them experience The Royal Tyrrell Museum. This trip was joined by another teacher, whose comments on Hal's methods indicated his initial reluctance of allowing

students to experience the museum instead of filling out a worksheet or mapping assignment. However, after the trip he agreed that the students benefitted academically after experiencing the museum. Hal observes the students and notices specific learning cues:

Example 36

1. Well, I mean the fact that the students were taking a lot of pictures of things and sending them back to their friends who were at school who were not on the trip, just sort of, and to sort of brag about that.
2. And I think he went and purposefully asked them a lot of questions about what they had learned and what they liked about the museum, more like he wanted to check to see that they had gotten something out of it.
3. And, and for me I think like you could fill in all the blanks that you want on a piece of paper and not get anything out of that.
4. But, just the fact that they, they didn't want to leave, they all bought something at the souvenir shop that had some kind of dinosaur thing on it, like, and that student's comment to me about how he's wanted to travel, like that kind of stuff.
5. It's just, that's the anecdotal evidence that you get every time you take them out.

Specific words and phrases co-locate with one another to possibly portray a biology teacher on a field trip to a museum with students: students (line 1), the trip (line 1), the museum (line 2), they didn't want to leave (line 4), and take them out (line 5). Furthermore, in this context these words portray Hal as the kind of teacher who is observant of student behaviour during a field trip. His language focuses on students' behaviour in terms of excitement rather than student learning: they took a lot of pictures (line 1); they were bragging to their friends not on the trip (line 1); and they did not want to leave (line 4). Furthermore, he uses the phrase "every time" when referring to the frequency of student excitement (real learning) during outdoor activities. The linguistic emphasis upon student excitement is important because it reiterates earlier results. The Connections Building Tool shows that student excitement is "real learning" and this kind of learning happens in Banff field. As The Doing, Not Just Saying Tool indicates, by connecting to "real learning", Hal's language suggests that "real learning" can occur outside of the classroom,

such as at The Royal Tyrrell Museum. This tool additionally demonstrates that providing

students the opportunity to experience a place simultaneously gives them a chance to learn

independently.

The Social Languages Tool additionally represents Hal as valuing an immersive learning

environment that is complementary to students learning independently. This is evident in Hal's

description of what he would like to do in teaching (Example 35 lines 3-6, see the corresponding

topic chain below):

Topic chain (lines 3-6, words linking topics capitalized)

what I would like [about teaching] → outside with students a lot more → BUT → I feel
constrained [by red tape, demanding curriculum, and this school is not accessible to a
nice, natural area] → same THING happens with any hands-on activity in science

The topic chain clarifies what Hal would like to do more frequently in teaching: going outside,

and practical, hands-on activities. Lexical cohesion further emphasizes that he would "love to

take students out more" (line 4 and line 5). The use of emphatics: love, more, and a lot

additionally stresses what he would like to do more of in his teaching. However, he mentions a

few obstacles, including red tape, curriculum, and geographical location. The phrase "red tape"

is used in a specific way—its situated meaning refers to school administrative requirements of

bringing students outside. These obstacles and what he wants to achieve without them seems to

represent part of a social language of a specific type of teacher, one who wants to make further

use of immersive learning environments.

Overall, Hal's social language depicts him as a science teacher, his values for students to

learn independently, and for using immersive learning environments. These values, in turn,

portray Hal as the kind of science teacher who wants students to view the world with a scientific

lens in order to understand any environment.

7.5 The Figured Worlds Tool

Within Hal's figured world, the outdoors is more than another classroom, it has pedagogical value in several important ways. Hal values the outdoors academically, for its examples of scientific theories, and as a setting for scientific processes and learning specific content. Hal also values the outdoors non-academically, as a setting for real learning, where students can get excited about science. Together, these demonstrate Hal's holistic educational value for incorporating the outdoors. Even if the outdoor activity requires extra work, such as an activity on food chains, he is willing to put in the time if he feels it is important (see the following example):

> Example 37
> (Hal was asked whether the outdoors are important to his teaching.)
>
> 1. Um, yeah, I mean, how can you teach biology especially, and talk about the world outside and not take kids out?
> 2. I mean, I'm from a rural, Northern Alberta background.
> 3. And what I find surprising in the city, I don't know if you can call them city kids if you've been living in the city for so long yourself but, is that we talk about food chains and food webs and they have no idea.
> 4. It's like, human cow grass, like that's their idea of a food chain.
> 5. If you don't take them outside, how are they ever gonna learn that kind of stuff?
> 6. I mean it's unfortunate as well that we have such a tight curriculum that it's hard to just say, "Hey, let's go on a nature walk" and I can tell you about, I can name all the plants and animals in this river valley and so let's go and do that, you know?
> 7. But like, especially in high school, that becomes hard because your content is so, the programs that we teach are so content heavy.
> 8. And yeah, they're about the outdoors and interaction but uh, it's, it's a lot easier to stand in front of the classroom and talk about that than to take them out.
> 9. But, it's important to do it.

When Hal says, "it's a lot easier to stand in front of the classroom and talk about that than to take them out" (line 8), the Fill-In Tool reveals that Hal is comparing the preparatory work involved with a lecture style lesson versus an outdoor activity. The example shows that when Hal teaches

biology such as food chains, or talks about the outside world, he includes the outdoors because he feels it is important (line 9).

Furthermore, these examples provide greater insight into Hal's figured world. Certain knowledge can only be gained from the natural outdoors, such as the interconnectedness of the ecosystem as represented by food chains. This suggests that in Hal's figured world, learning and setting are intimately tied to one another. Extending this notion, Hal may use particular settings when teaching particular content, even though it may take extra time; this is indicative of his teaching practice. Accordingly, another aspect of his figured world is putting in extra effort in order for students to learn best at the best setting. For Hal, everything pedagogically important can be found in the outdoors, so that the outdoors may be used as a source and setting for scientific processes and theories. It may also be used as a teaching tool to help develop students' attitudes and understandings towards science.

In Hal's figured world, the outdoors has scientific educational value. Rather than viewing the outdoors as merely an example of theory, it is a setting where scientific processes occur, where students can learn and get excited about science. This was seen earlier from The Connections Building Tool, by connecting the outdoors with real learning, where students get excited about science and where science happens. The phrase "real learning" (Example 35) indirectly sets up a comparison and connects the outdoors with a specific type of learning: interactive learning in an outdoor setting. Hal's answer to Example 37, above, thus portrays Hal as the kind of teacher who is enthusiastic and excited about science. He wants students to develop a similar attitude towards science, which he achieves by providing opportunities for students to learn through their curiosity, such as letting them experience The Royal Tyrrell Museum. He also seems to support students developing a scientific lens to view the world and a

voice for their own learning. Consider the way his description below and the corresponding

topic chain represents a social language:

Example 35

1. Well, I think that often when we're teaching, I always say like it's not about what we're learning it's about learning how to learn.
2. Because it doesn't matter what's in the program of studies you know, you can pick and choose and replace different things and it's really about teaching students how to learn and I mean, some of them probably won't spend a lot of time outdoors but this is an opportunity to tell them a little bit more about the world outside of the classroom.
3. I mean, I guess I can talk about what I would like and what I actually do.
4. You know, I would love to be with students outside a lot more, but I do feel constrained by the red tape, by the demanding programs of studies that we're expected to get through and just by the position of this school not being very accessible to a nice, natural area…
5. I would love to take students out more.
6. …Think the same thing happens with just any kind of hands-on practical lab skills stuff in science.
7. It's like, I know I should be doing more chemistry labs but it sure is a lot easier for me to stand up here and say, "Here's how to do this kind of equation.
8. Do some practice worksheets and we can move on."
9. Labs take more work to set up and there's an element of you're not in control, right?
10. Because now there's ten groups around the classroom who are all in control of their stuff.
11. And going outside is the same kind of thing, right?
12. Like when I go to [local park] with students we do like the field study and stuff, but we also do gold panning which is not at all part of our program of studies other than we have a geology component, so I can kind of loosely tie it in or whatever.
13. But, it's really amazing to them that they can get gold from [local river].
14. Like, the average person here probably wouldn't know that.
15. Like, every time you put your pan in there you'll get some gold flakes not flakes, sorry, gold dust, powder, like you'll see it.
16. And yeah, you have to do it for like 10 minutes of swooshing and you get a few flecks of gold but, to those students that's pretty mind blowing.
17. Like, they think they're all rich instantly, that I've given them the secret to this but to think if you want an ounce of gold, you gotta be out there for a few months, right, or more.

Topic chain (words linking topics capitalized)

teaching → learning how to learn → BECAUSE → curriculum content does not matter → It's really about teaching students how to learn → AND → some teachers may not spend a lot of time outdoors → BUT → THIS is an opportunity to tell them a bit more about the world outside the classroom

The topic chain clarifies Hal's pedagogical view: teaching is about students learning how to learn (as opposed to learning content).

Hal's language also uses positioning to present him as the kind of teacher who incorporates the outdoors. This is exemplified in the following statement from line 2: some of them probably won't spend a lot of time outdoors. The pronoun "them" represents a group that does not include Hal (since he did not use "us" or "we"); "them" are students who do not "spend a lot of time outdoors" (line 2). By relating those students' experiences to a group of teachers as separate from himself, Hal's language positions him as the kind of teacher who does spend a lot of time outdoors. Particular vocabulary co-locates to represent Hal as a teacher in Alberta and in that context, his phrasing portrays value for students learning independently: we're teaching (line 1); learning how to learn (line 1); doesn't matter what's in the program of studies (line 2); teaching students (line 2); some of them won't spend a lot of time outdoors (line 2); this is an opportunity to tell them about the world outside the classroom (line 2). Further support comes from The Doing, Not Just Saying Tool that indicates that Hal's language challenges traditional purposes of teaching, so that teaching is about teaching students how to learn as opposed to learning content. Repetition of "how to learn" (repeated twice, lines 1-2) reifies this view.

These examples cumulatively provide more detail into Hal's figured world. He is the kind of teacher who uses multiple sources and environments in his teaching and is willing to put in extra effort for his lessons if it is more effective for his students. Also, he provides students

the chance to be guided by their curiosity as a method of learning. For Hal, the outdoors is a setting that provides examples of theory and real learning and is where students can get excited about science. Banff field, for example, may be used for a field study and the opportunity to discover and touch starfish is a different experience than what is available in the classroom. These teaching methods demonstrate Hal's value for students developing their own scientific lens to understand the world.

7.6 Case Summary: Hal

The discourse tools reveal several of Hal's key characteristics as a teacher. Firstly, the particular words and phrases in his social language portray him as an Alberta biology teacher who incorporates labs and field studies in his teaching (as revealed by the Social Languages Tool). This is further supported by his social language and the use of rhetorical devices and assumptions (as shown from The Fill-In Tool) to position himself and the listener as teachers. Furthermore, The Activities and Identities Building Tool demonstrate that his teaching practice lets him be recognized as a biology teacher. Hal's descriptions of directing student learning, providing instruction, and leading discussions to guide student thinking all contribute towards his recognition as a biology teacher.

The Activities and Identities Building Tools also reveal Hal's value for students to learn independently, such as his description of trying to get students to understand their everyday experiences through a scientific lens. He describes that he achieved this by incorporating outdoor investigations, such as using coloured toothpicks to simulate camouflage of prey in an environment, and having students collect photo evidence of secondary succession from their neighbourhood. Descriptions of these investigations show that students are connecting science

theory with understanding their surroundings. Furthermore, the design of those investigations contributed towards student independent learning because instead of directly providing answers, Hal used rhetorical questioning and the provision of clues to guide them towards the solution. An important aspect of the investigation design is that students are active participants in their learning and are engaged with the environment.

Along with designing investigations, Hal's social language and his figured world reveal that he provides an opportunity for students to be guided by their curiosity. For example, when Hal spoke about the Royal Tyrrell Museum trip, his language focuses on student excitement; The Connections Building Tool shows that this excitement correlates to real learning. In addition, The Social Languages Tool and The Doing, Not Just Saying Tool show that Hal's description of real learning occurs when students are in outdoor settings. Student excitement is significant to Hal's figured world of teaching because he would like his students to develop an appreciation for science. The Figured Worlds Tool suggests that complementary to this appreciation is teaching students how to learn, which ultimately contributes towards their ability to learn on their own.

The discourse tools also revealed that Hal considers the outdoors as a pedagogical setting. The Connections Building Tool, for example, connects the phrase "science is everywhere" to a range of locations, including the outdoors, international locations such as the Galapagos and its pictures, newspaper articles, and everyday experiences. The Figured Worlds Tool reveals that Hal's typical teaching methods include the outdoors for specific topics, such as food chains, suggesting that certain content is best taught from an outdoor setting. However, The Connections Building Tool shows that Hal's language connects the outdoors to more than just science: the outdoors are connected with real learning, a setting where students can observe scientific processes and get excited about science, and a setting where students can develop a

scientific view to understand the world (also from The Significance Building Tool). The Social Languages Tool portrays that these connections represent the outdoors as more than pedagogy, as an immersive learning environment).

Overall, the discourse tools reveal that Hal is recognized as a biology teacher, that he values students learning independently, and that he values and uses the outdoors beyond a pedagogical setting.

Chapter 8

Discussion: Big "D" Discourse

8.1 Introduction

Together, the previous small "d" discourse tools (The Significance Building Tool; The Activities - Identities Building Tool; The Connections Building Tool; The Social Language Tool, The Doing, Not Just Saying Tool, The Situated Meaning Tool; and The Figured Worlds Tool) reveal different facets of biology teacher identity that contributed to incorporating outdoor settings with their teaching practice.

Big "D" Discourse combines those small "d" discourse tool results and synthesizes and distills them to go beyond language to determine an individual's way of being a biology teacher, such as attitudes, values, goals, their understanding of science and science teaching, and how that impacts their integration of the outdoors. In this study, Big D (Discourse) accesses and transcends small d (discourse) results to recognize and describe the kind of biology teacher who uses the outdoors. This section examines the way identity frames understanding and practice of biology teaching to integrate the outdoors.

8.2 Big "D" Discourse: Zatanna

Zatanna's discourse portrays her as the kind of teacher who is responsible towards her teacher duties by fulfilling curricular objectives. She prioritizes students by valuing their learning and her relationship with them. These characteristics and others of her teacher identity may be partly responsible for her incorporation of other learning environments during her teaching.

Zatanna's conception of teaching is manifested in her teaching themes and these contribute towards her inclusion of the outdoors. For example, The Activities - Identities Building Tool illuminate that she recognizes herself as a teacher who is responsible for her teacher duties due to her fulfillment of curriculum requirements (Example 7 – she expresses that during her initial year of teaching, she was fulfilling all of the curriculum objectives, especially bringing students on a field study). She has a particular perspective, and this may show that part of the way Zatanna understands teaching is to consider the curriculum objectives as mandatory exactly as written, such as taking students on a field study for Biology 20 because "field study" is specifically mentioned in the program of studies (Alberta Education, 2009). She also views the field study as a requirement, and this also indicates that to her, including the outdoors is a requirement. This was supported by lexical cohesion (repetition of lexical items, see Appendix B) and The Connections Building Tool (how words connect and disconnect ideas, see Appendix B) since both indicate through phrasing that incorporating the outdoors is necessary as part of the curriculum (Example 7). The aforementioned discourse tools additionally show through identity contrast that Zatanna recognizes that not all teachers fulfill the curriculum in its entirety, especially the field study (Example 7, line 3), and she constructs her identity in relation to that perception. This contrast emphasizes Zatanna's personal commitment to fulfill all curriculum components, since she does not appear to be influenced by the practice of others.

The way that Zatanna recognizes herself exemplifies the co-construction between identity and activity (or practice). For example, her view of curriculum affects the way that she teaches so that all curriculum requirements are met without question. Whether other teachers do the same is irrelevant to her since she is aware that other educators do not fulfill parts of the curriculum, especially the field study. That is, her identity shapes her practice and at the same

time, her practice reifies her identity so that it does not matter to her what other teachers do in their classroom with respect to curriculum fulfillment. This is an identity finding because it shows a particular purpose (fulfilling curriculum requirements) at a certain time and place (presumably during school hours in a classroom) to be a certain way in the world (for Zatanna that mans a teacher who fulfills the curriculum in its entirety).

Zatanna also comprehends teaching by valuing student learning. For instance, results from The Significance Building Tool show that Zatanna's main topics and lexical cohesion describe her teaching practice as continually searching for and using more effective activities while discarding those that are less potent. The effective activities include laboratory investigations that she uses frequently, as shown from main topics, lexical cohesion, repetition, and emphasis in her description and they may be in settings other than the indoor classroom. Zatanna's language seems to indicate that she places greater priority upon the effectiveness of an activity in terms of student learning regardless of its setting. For example, results from The Activities and The Identities Building Tools (used to indicate a certain identity consistent with a certain activity, see Appendix B) indicate that her description of the winter field study investigation positions the listener to recognize the effectiveness of the outdoors as a learning context (Example 7, line 15).

If it was not for her value for student learning and flexibility in considering settings other than the traditional indoor science classroom, she may have never known the way her students thrived while learning biology outdoors. To expand upon that, one of her teaching goals may be for students to enjoy their learning experience regardless of the setting and that finding was supported by The Activities and The Identities Building Tool (see Appendix B). To gauge the success of a particular activity, she considers student reactions as one representation of its

211

effectiveness: the more positive reactions from students, the more effective the activity for learning science and the more likely she would be to repeat this activity with subsequent classes. For example, students' enthusiasm during the first winter field study inspired her to use that activity each year as an auxiliary to its inclusion of the curriculum. Also, results from The Connections Building Tool (see Appendix B) connect the outdoors with students' excitement for learning and The Cohesion Tool (helped explain how ideas are linked to each other) shows support in the form of quantifiers that further emphasized their excitement in an outdoor setting. These discourse tools seem to indicate that her concern for student enjoyment during scientific investigations is irrespective of its location. In other words, Zatanna's views regarding viable settings for studying biology are partly based on students' reactions, ex. if students responded well to an activity in a particular setting, then that is an appropriate learning environment. Her social language supports this view through collocational patterns (a group of words that signify a certain social identity and/or activities, see Chapter 4.3.1.4) (seen in Example 12 - where she emphasizes focusing upon students rather than subject matter) such as justifying the outdoors based on what students can learn from that setting and The Social Languages Tool and Doing, Not Just Saying Tool and Situated Meaning Tool (clarifies actions associated with a social language while bounded by context) show further support by validating incorporation of the outdoors based on her personal experiences when using those activities.

Her justifications suggest that she incorporates the outdoors based on what she thinks can be learned (about biology as a discipline) in an outdoor setting. Results from The Connections Building Tool (see Appendix B) show that Zatanna's language makes the connection between outdoor settings and teaching by associating that biology (the study of life) happens in the

outdoors, while The Fill-In Tool (provides insight and context of responses, see Appendix B) indicates that she may want her students to connect course content with the environment.

Zatanna's continual search for more effective activities to use with her teaching practice exemplifies the co-constructive relationship between activity, identity, and sociocultural context. In this case, activity refers to Zatanna's teaching practice – recall from Chapter 3 that an activity is a conventionalized social endeavor (Holland et al., 2001). In this case the students reactions can be understood as a sociocultural context because students are the key interactive partners with the teacherwho maintain the social culture of the specific classroom in question. This is sociocultural context on a more micro level, focusing on a very narrow community but it still creates similar impacts on the teachers in a way consistent with sociocultural thinking. Because Zatanna bases the effectiveness of an activity upon student reactions (sociocultural context) and makes choices based on those reactions (activity) such as whether to continue using a particular lab investigation (identity), this shows how activity, sociocultural context, and identity simultaneously shape each other. That is, the activity (teaching), and sociocultural context (student reactions) inform Zatanna's identity (reifies her teaching practice and what she beliefs is effective teaching).

Zatanna also understands and approaches her teaching from other perspectives. This is best exemplified with The Significance Building Tool (demonstrates what was linguistically significant through wording and positioning), which shows her value for mutual respect. For example, from her description of her class rule (Example 5 - her only class rule is respect) the main topics show and explain her only rule. In her class, respect is when teachers and students are allowed the same privileges. When she describes those privileges (Example 6 - and why she grants those privileges), the main topics are lexically cohesive and emphasize the same benefits

for both Zatanna and her students. In addition, she holds herself accountable to the identical rules she sets for the students and the degree of her belief is represented by the quantifier "never" (Example 6) by saying that she would never do something that her students are not allowed to do in class. Her value for mutual respect and equality in the classroom may lead to developing trust with students, and a confidence with students that may contribute to implementing activities that require trust, such as those that are outdoors. The Fill-In Tool (see Appendix B) echoes this sentiment by revealing that prior to and during an outdoor activity, Zatanna has to believe she can depend on students to work independently in that setting since they would be scattered at different locations. Lexical cohesion (repetition) from her description stresses that trust by twice repeating that she does not see all her students at the same time during the winter field study as she would in a classroom. These outdoor activities are shared experiences between Zatanna and her students and their increased familiarity may lead to more trust and deepening their relationship. Results from The Connections Building Tool (the connection or disconnection of ideas through words and grammar, see Appendix B) echo this notion by connecting outdoor activities with furthering trust and relationships with students. When she describes the positive results from students after implementing outdoor activities, her language uses "because" (Example 10, line 4) to indicate that the use of outdoor activities strengthened their relationship.

The way that Zatanna shows her value for mutual respect is complementary to the co-construction between activity, sociocultural context, and identity. For example, establishing her class rule is part of her teaching and that is an activity since it follows a social convention (Holland et al., 2001). That rules establishes her classroom culture, that is, the sociocultural context specific to the way she is as a teacher and her relationship with students. In turn, her class rule reinforces her recognition of identity (since she holds herself accountable to the same

214

rule as her students). All together the activity of having the one class rule sets the foundation for the micro sociocultural context of the classroom and that strengthens her view of equality between teachers and students. In addition, these demonstrate an identity result because her way of being in the classroom (valuing mutual respect) is reified through her rule and class atmosphere.

Cumulatively, the discourse tools reveal that Zatanna's understanding of the nature and essence of teaching contributes towards her inclusion of the outdoors. She considers the curricular objectives as mandatory and completes all of them, including the field study. She also values student learning, including their reactions to the investigations. She prioritizes the effectiveness of an activity and students' excitement over an activity's location. Zatanna also values mutual respect and equality in her class. These qualities may develop trust, which supports her use of outdoor settings since she must trust her students to be able to work independently in that environment.

Overall, these results combine to form a Discourse that seems to portray her as the kind of teacher who is particular about fulfilling requirements, valuing at all times student learning and mutual respect. These characteristics may help her use outdoor settings by viewing the field study as a necessary component of teaching, having a flexible view of learning settings so that she prioritizes the learning benefits more than the location of a scientific investigation, and trusting her students, thereby allowing them to work independently outside of the classroom. For Zatanna, teaching encompasses an administrative aspect as well as the academic and non-academic well-being of students, and the setting for that teaching includes multiple environments. Her priority for student learning is manifested in her efforts to provide the best setting for that to occur. That is, if she feels that the learning for certain content would best occur in an outdoor

environment, then she will integrate that setting. Additionally, those results also exemplify co-constructive relationships between identity and practice; and identity, sociocultural context, and activity. Another view of those results is Zatanna's relationship with nature. In contrast to Hoeg's (2016) doctoral thesis results, Zatanna views nature as harmonious with science education from a few different levels, namely: curriculum requirement, learning benefits in outdoor environments, and a setting to develop trust.

This section has presented a Big D Discourse (see Appendix B) of Zatanna to describe an overall image of the way her understanding of teaching supported her use of the outdoors. These findings may be used to inform an initial Discourse that encompasses a particular group of biology teachers who integrate the outdoors with their practice. This group may potentially include the remaining participants in this study and their Big D analyses are described in the following sections.

8.3 Big "D" Discourse: Shiera

The discourse results reported in Chapter 5 appear to characterize Shiera as having teaching confidence, a flexible teaching style, and the ability to build relationships with students. In addition, earlier discourse results indicate that her teaching goals are based on the values that she wants to instill in students for the long-term, such as having their own voice for learning, being "good people," and having a positive view of nature. Moreover, her language represents her values for the outdoors, connecting outdoor experiences with positive feelings and appreciation.

Shiera's understanding of teaching is exemplified by her flexible teaching style as indicated through repetition and phrasing indicating her preference for using different teaching methods (via The Lexical Cohesion Tool, The Activities Building Tool and The Identities Building Tool, see Appendix B). A topic chain in Example 17 (where she explains the variety in her teaching practice) provides further grammatical support, suggesting that Shiera is the kind of teacher who enjoys variety. The Activities Building Tool and The Identities Building Tool (see Appendix B) indicate that her interest in teaching is constantly renewed due to the opportunity to try, and her willingness to try, other ways of teaching. The Social Languages Tool (used to identify a social language) further supports that she is willing to try other ways of teaching, which is demonstrated by her non-routinized teaching style that is not bound to a single method. Together, these tools indicate a value for using other ways of teaching and appear to point to a Discourse of teaching that values a variety of teaching styles. Her value for variety may contribute to using other learning settings, such as the outdoors.

Shiera's teaching style of using a variety of teaching methods seems to provide evidence of the co-constructive relationship between activity and identity. Earlier (Chapter 3) teaching was described as an activity since it is conventionalized and collectively developed. Chapter 3 also described identity as a way of being in the world grounded by context, namely time, place, and purpose (Gee, 2011a). The relationship between activity and identity simultaneously shape each other in Shiera's teaching style because as her identity includes being the kind of teacher who enjoys variety, her teaching style is based upon using various teaching methods. In other words, Shiera's identity reifies her activity (of teaching) and vice versa. This demonstrates identity because it shows that part of teacher identity includes an understanding of teaching that it can include using different teaching methods.

This value was exemplified from other small "d" discourse results by revealing that her language relates the outdoors both as a teaching tool and philosophy for teaching, as well as linguistically prioritizing outdoor experiences (for further details, see results from The Connections Building Tool, The Social Language Tool, The Doing, Not Just Saying Tool, and The Situated Meaning Tool). For example, she tends to bring her students outdoors during the beginning of the school year before the weather turns, prior to the students furthering their scientific skills, knowledge, and familiarity with Shiera's expectations (Example 26 and 27, where she describes her most recent field study, and student characteristics that indicate their enthusiasm when learning outside, respectively). This suggests that outdoor experiences during fair weather conditions are more important than students being fully prepared for an outdoor investigation. The outdoors is also linked to Shiera's teaching philosophy when she describes the outdoors as part of a big picture when studying science (Example 28). Certain words from her discourse (via the Connections Building Tool, see Appendix B) link the big picture of science with the concept that nature is amazing and the only way to know that nature is amazing is by experiencing the outdoors. This amazement with nature is supported through phrase repetition (Example 28 – when she explains the outdoors as both a tool and philosophy for her teaching), collocational patterns (Example 24-27, she describes why she used a field study as an activity, how she makes the field study a big deal for her classes, her most recent field study, and how students show their enthusiasm when learning outside, respectively), and what is considered typical in her teaching. The Figured Worlds Tool (what teachers consider to be typical in their teaching, see Appendix B) also shows that using the outdoors is typical in her teaching. Collectively, it seems that Shiera's understandings of teaching biology and the big picture of science facilitate including the outdoors with her practice. Because taking students outside is

typical in her teaching, this may be representative of her pedagogical value of the outdoors and her efforts to instill in students an appreciation for the natural world. From this perspective, Shiera's understanding of teaching biology seems to extend beyond the curriculum. Her teaching seems to embrace a big picture view of science, that the natural world is an object of awe and that the curricular topics are offering just part of that experience for students.

The way that Shiera views the outdoors as both a teaching tool and philosophy represents the co-construction between identity and activity. Because her teaching (activity) includes using the outdoors, this reifies her understanding that the outdoors is a part of science teaching (identity). From that example, activity and identity simultaneously shape and develop one another so that they are mutually strengthening. Similar to her previous characteristic of the way she understands teaching, this example sheds greater light on identity by showing that science teaching can include the outdoors.

Shiera's descriptions of her teaching also suggest other views of teaching. Firstly, The Significance Building Tool reveals through words and phrases that trust and relationships are important to Shiera. This is supported through lexical cohesion and repetition and The Topic Flow or Topic Chaining Tool (shows how topics are related to one another through language structure). Her language makes trust and relationships significant to her teaching, suggesting that she cares for more than the academic well-being of students. That is, her view of teaching includes developing a relationship with students based on trust. Because she values relationships, she may be more amenable to activities and settings that encourage them, such as the outdoors. Emphatics in her language stress how quickly a bond develops with students when an outdoor activity occurs at the start of term (Example 19) and this was supported through substitution where experiences in natural settings are connected with real bonding (Example 19). In addition,

getting to know students on a more personal level is commonplace in her teaching. Getting to know students to develop trust contributes to a learning atmosphere where students are more agreeable to trying Shiera's different teaching methods and perhaps even seeing science the way that she does.

Shiera's value of trust and relationships is one example of the way that identity and sociocultural context influence one another at the same time. This shows that part of identity includes her values. While the sociocultural context are the relationships that she builds with students. Since her value is the foundation for those relationships, those relationships also reinforce that value and that shows one way of identity and sociocultural context shaping each other. Additionally her value helps to illuminate her identity by showing that other characteristics such as the importance of trust and relationships contribute towards it.

Part of Shiera's approach to teaching is her concern for the future of the natural environment. For instance, one of her personal goals in teaching is to instill a value for the environment in her students so they may become future stewards, and this was supported via a quantifier, lexical cohesion, and specific vocabulary. Shiera's desire to instill her value for the natural environment in her students suggests that teaching includes passing values on to students, so they may affect the future. Cohesion in her discourse indicates that Shiera considers experiences in natural settings to be so positive that they are a basis for appreciating nature, and that appreciation becomes a basis for taking care of nature (Example 17 and 19, where she describes her variety in her teaching practice, and why she likes using outdoor activities with her classes, respectively).

Shiera instills this value in her students by providing a positive experience so they may develop an appreciation for the natural environment. For instance, collocational patterns (a grouping of words that indicate particular identities and/or activities) portray her efforts to maximize student enjoyment, such as ensuring good weather by taking students outside prior to the onset of winter, considering the amenities of the outdoor activity location, and continuing the use of student-designed field studies when students take a personal interest in them (Examples 25, 27). Her language also links good weather with students liking nature by considering weather as a factor when conducting an outdoor activity and connecting good weather with nature for a positive experience (Example 21). She tries to ensure favourable weather by having multiple dates on her permission forms so that they have the option of cancelling in case weather conditions are unfavourable (Example 21) and by eliminating factors that may lead to a negative experience and possibly a negative outlook towards nature. This was supported by her language making bad weather relevant to students having a negative experience (Example 20-21).

Shiera also plans outdoor activities to increase the chances of students having a positive experience in the natural environment. This planning includes: revising studies from previous years to ensure student enjoyment (Example 25-27) and using student-designed investigations that encourage them to become independent learners. Because students design their own labs, they are better able to complete them, a connection that is supported by phrasing, words linking topics, and repetition via The Cohesion Tool (indicates how ideas are linked to each other) (Example 23 – she explains why she uses student-designed labs), and by topic chaining (how ideas are related) (Example 22, she describes the importance of field studies to her teaching).

The way that Shiera includes her concern for the future of the natural environment illustrates the co-constructive relationship between sociocultural, activity, and identity. Because she wants to instill in her students a value for the natural environment, a classroom culture of future stewards is initiated. That resonates with Lemke (2001) where a sociocultural approach is a way of understanding classroom culture. While her style of teaching to include outdoor experiences is an activity (see Chapter 3 for a discussion of teaching as an activity). In trying to have students value the natural environment through the inclusion of outdoor experiences ultimately affects her decision to continue to use natural settings. That decision helps to illuminate that decision regarding praxis, such as using the outdoors is part of teacher identity.

Cumulatively, Shiera's concern for the natural environment is part of her big picture of science. In this view, the outdoors is a landscape of human interactions with the environment where positive experiences in nature can develop attitudes towards conservation and values for these settings. In turn, these attitudes and values can have long-term effects where students may see themselves as environmental stewards.

In addition, Shiera's concern for the environment appears to lead to being in harmony with nature. One example is her big picture view of science. As mentioned earlier, Shiera's view of science is that nature is amazing. This shows a view of science that is not separate from nature. Moreover, to instill that view into students, she tries to get students to like nature through positive outdoor experiences such as going during good weather, eliminating negative factors, revising previous outdoor activities, and using student-designed investigations (to build student confidence with their skills while in outdoor settings). While those investigations use nature as an object of study and seem to separate science and nature, Shiera's big picture of science unites them. This contrasts with Hoeg's (2016) findings of teacher praxis using domination and control

to gain knowledge of nature. For Shiera, it is about recognition of the awe that nature has to provide and to protect that awe, stewardship (not domination) is needed.

Overall, the preceding paragraphs present Shiera's Discourse as a portrayal of the way she enacts and embodies her teacher identity. Her Big D is complementary to that of Zatanna since they both see themselves as teachers who use alternative learning settings and value the outdoors as a rich setting for furthering relationships with students.

8.4 Big "D" Discourse: Hal

Discourse findings from Chapter 7 represent Hal as a teacher who prioritizes investigations with his teaching. In addition, discourse findings depict him as the kind of teacher who views the outdoors as a pedagogical setting and would like his students to do the same by understanding their everyday experiences through a scientific lens. He also provides opportunities for students' learning to be guided by their curiosity, which may signify a value for students learning independently.

Hal's understanding of teaching is demonstrated by his teaching style, and this understanding may contribute towards his inclusion of the outdoors. His language uses specific vocabulary to signify the importance of learning biology in outdoor settings (Example 29 – where Hal describes one of the best courses he took during his science undergraduate course) and indicates that he views the outdoors through an academic lens. Specific wording clarifies that his language makes the outdoors significant to his teaching (Example 29) and emphasizes the outdoors by multiple references. These examples suggest that Hal's Discourse includes a pedagogical understanding and view of the everyday world so that any environment can be used as a setting for learning.

In addition, his teaching style is an example of the co-constructive relationship between activity and sociocultural-historical context. Consider his teaching practice of including outdoor settings as an activity since teaching is conventionalized and collectively developed. Also consider his past experiences as a sociocultural-historical context since it occurred in the past within an Alberta setting (ex. in Banff, Alberta as part of his studies at an Albertan university). That experience had a long-term effect such that he realized the value of outdoor settings for learning biology. By continuing to include the outdoors with his teaching, it reinforces the impact of that undergraduate course. This relationship between activity and sociocultural-historical context relates to identity by showing other factors, like past experiences, can impact pedagogical decisions towards his practice.

Hal's view of the outdoors is typical of his practice and is evident in his figured world of biology teaching. For example, Hal believes certain knowledge can only be obtained from the natural outdoors, suggesting that learning and the setting where the learning occurs are closely linked to one another in his figured world (what he considers typical to his teaching). He may use specific settings when teaching certain content, such as bringing students outdoors when teaching about food chains. He also views the outdoors as a place where scientific processes occur and where students can get excited about learning (what he has previously referred to as "real learning"), which is supported by specific phrasing that connects the outdoors with interactive learning (Example 35). This view contributes to his Discourse by showing that part of Hal's understanding of teaching includes providing the best setting for learning. In addition, those settings provide learning experiences where students can get excited and that differs from the indoor classroom.

Since Hal views the outdoors as a pedagogical setting, this exemplifies the way that activity and sociocultural context simultaneously shape one another. In this case, his use of the outdoors as a learning environment can be viewed as an activity because it is an aspect of his teaching. While his connection of content to setting appears to be sociocultural due to relating Alberta provincial curriculum content to Alberta locations and those are all grounded within Albertan culture and society. That connection illustrates the way that sociocultural context (relating Alberta curriculum content to Alberta locations) influences activity (viewing the outdoors as a learning environment). In other words, by considering the outdoor environment as settings for teaching certain content, this reinforces his view of the outdoors as pedagogically appropriate. Because his view of the outdoors as a pedagogical setting is typical to his teaching, it appears to be an ingrained view that can be a characteristic of his teaching style and/or the way that he understands what science teaching looks like.

His view of the outdoors is consistent and complementary to the Albertan curricular view. For example, within the Biology 20 curriculum, a couple of the objectives are for students to plan and perform a field study for students to quantitatively measure biotic and abiotic characteristics within a particular ecosystem (Alberta Education, 2009). Since Hal considers the outdoors as a pedagogical setting, this is consistent with successfully fulfilling those objectives. However, Hal's view is not limited to those particular objectives. Rather, his philosophy "that science is everywhere" (Example 30) is complementary to the Albertan curriculum. An implication of his statement is that the outdoor settings and science are inseparable from one another and goes beyond what is learned in the classroom. That implication contrasts with Hoeg's (2016) findings that school science practices "typically portrays nature as a resource, separate and distant from the student" and "generally constitutes ways to know nature based on

oppression, manipulation, control and dominance of nature" (p.231). However, it is unsurprising that different science teachers will have different ways of using the outdoors.

Hal's teaching goal is to guide students to make connections with the outdoors, and this indicates that his investigations are designed for students to make those connections. For instance, he describes investigations about natural selection (Example 31) and secondary succession (Example 32) to suggest that they are designed for students to start developing a scientific view of their everyday surroundings. Also, Hal's language uses positioning to treat the students as beginning learners by using rhetorical questioning (Example 31), and provision of clues (Example 32) to guide their learning. A characteristic of Hal's teaching is to guide students to determine their own learning, and this was supported via repetition (Example 35, where he explains his use of the outdoors). He encourages students to make their own connections by providing opportunities for them to be guided by their curiosity, such as his description of letting students experience The Royal Tyrrell Museum (Example 36). His phrasing also stresses the frequency of student excitement seen in these other learning settings. He values those learning environments that further students' independent learning (Example 35) and this was supported by emphatics and lexical cohesion. Hal's Discourse includes teaching as a guide so that students may start to make their own connections between theory and the outside world, and to become independent learners. For Hal, the outdoor environment might be the best setting for this endeavour since students work independently or in small groups scattered throughout the location.

The way that Hal guides students to make connections with the outdoors illustrates the co-constructive relationship between activity, sociocultural context, and identity. For instance, from Chapter 3 teaching was described as an activity. Hal's teaching (activity) is to act as a

226

guide so that students may become individual learners such as connecting the outdoors with science. His kind of teaching affects the sociocultural context within the classroom such that the class atmosphere focuses on students learning individually. In turn, his class atmosphere encourages his style of teaching. As a result of the mutual shaping between activity and sociocultural context, this also serves to reinforce Hal's teaching identity of having students become individual learners. In addition, these results show that teaching identity includes the way you want students to learn.

In addition to valuing the outdoors for academics, Hal also values it as a setting for developing students' appreciation of science. For example, his view that "science is everywhere" (Example 30) appears to indicate that he wants his students to have the same outlook, and the knowledge to share and develop that view. A topic chain from Example 30 clarifies that he aims for students to have a deeper appreciation of science, to view the world with a scientific lens, and to be excited about learning (Example 30 – he explains his view that science is everywhere). Hal's Discourse of teaching incorporates values such as appreciating science and passing those values onto students.

One way that Hal passes on those values is through his language, such as connecting the classroom experience to where science may be found. Hal emphasizes to his students that science may be found in places other than a traditional science classroom by connecting his lessons to newspaper articles. Because this occurs almost daily, this demonstrates to students the frequency with which science occurs. Since Hal typically uses these newspaper articles as examples of science, his language indirectly encourages students to consider the news through a scientific lens. He also uses international locations, such as the Galapagos, to highlight science beyond the classroom. By describing his trip as an example of biodiversity, he highlights the

connection between science and the world outside the classroom. These examples demonstrate that another way he tries to instill his value of seeing science everywhere is by showing students examples of science in their everyday world. This also shows that part of Hal's Discourse includes seeing science everywhere in everyday experiences, that is, science extends past the curriculum and textbook to our surroundings.

Hal's Discourse and way of being in the world as a biology teacher is characterized by his appreciation of science, such as viewing and understanding the world through a scientific lens. Because of this appreciation, the outdoors embodies his view of science. From his scientific lens, the outdoors is an ideal setting for learning certain content, as a place to observe scientific processes, as a location of scientific examples, an environment to get excited about learning and to be guided by curiosity, a context for students to further their appreciation of science, and other pedagogical views. An important part of his Discourse and one aspect of his understanding of teaching is to instill that value into his students.

His Discourse is an example of the co-construction between activity, sociocultural context, and identity. As previously mentioned in this chapter and Chapter 3, teaching can be considered as an activity. For Hal, part of his teaching style includes making science relevant to students' everyday lives. That relevance contributes towards sociocultural context. By connecting science lessons to newspaper articles and international locations, Hal creates a class atmosphere (sociocultural context) where science goes beyond the classroom. The simultaneous interaction between activity and sociocultural context also impact identity. In Hal's case, this means that identity includes his view and value of science (that science is relevant outside of the classroom) and trying to instill that value into students. Together, his teaching (activity) connects science past the classroom and sets the tone of the class atmosphere (sociocultural

context) to relate science outside of school, and each of those strengthens his view and value of science (identity).

Furthermore, Hal's Discourse illustrates the possibility of a harmonious relationship between science and nature. Because he values students making connections between science and the world outside the classroom, he does not separate nature from science. That value is diametric to Hoeg's (2016) doctoral results where teacher practice presents dominating and controlling nature. Instead, Hal wants to instill in students a view where "science is everywhere".

In sum, Hal's Discourse suggests that his teacher identity, represented by discourse, supports the inclusion of the outdoors. His inclusion of the outdoors as a learning environment is congruent to Zatanna and Shiera's integration of that setting. Whether these findings contribute to a common Big D among biology teachers who use the outdoors will be examined by a cross-case analysis in the following section.

8.5 Big "D" Discourse: Cross-Case Analysis

The preceding sections in this chapter described the Big "D" Discourse for each of the participants in this research investigation. The Big "D" Discourse Tool portrays the way of being a biology teacher and its effect on incorporating the outdoors by synthesizing, distilling, and combining small "d" discourse results (Gee, 2011b). Those results were necessary prior to further examination. The Big "D" Discourse Tool was used as a framework for a cross-case analysis because it can shed light on how understanding and teaching of science relates to integrating the outdoors. This allows for a comparison to determine whether there is initial evidentiary support for a common Discourse among those biology teachers who integrate the

outdoors with their practice. The remainder of this chapter discusses each of those themes and relates it back to the theoretical framework.

8.5.1 Big "D" Discourse Themes

8.5.1.1 The Identity and Conceptions of Practice Related to Curriculum

Overall, cross-case analysis findings revealed several Big "D" Discourse themes. The first theme is "the identity and conceptions of practice related to curriculum" (see Table 8.1). Each of the participants have a certain identity or way of being and/or conception of practice related to the curriculum. For example, because Zatanna views the curriculum as mandatory, her practice is to complete all curricular objectives (see Example 7 where she describes her view towards curriculum). That happened to include the incorporation of outdoor settings since having students complete a field study is part of the Alberta biology curriculum. The outdoors as part of curriculum was supported by Norðdahl and Jóhannesson's (2015) study that highlighted the Icelandic national curriculum guide, which stressed use of the outdoors as a setting for learning natural phenomena in natural science and environmental education. From this view, use of the outdoors helps fulfill curricular requirements.

In contrast, Shiera and Hal's way of being as related to the curriculum focused upon developing student attitudes towards science. Because Shiera wants her students to have a deeper appreciation for the environment, she incorporates natural settings, so students will form a connection and want to protect it. However, Hal wants his students to connect science to their everyday lives and he models this by bringing in real world examples such as newspaper articles, to show students the connection to what they are learning. Ballantyne and Packer's (2009) findings indicated that experience-based learning was an important factor in developing students'

attitudes. Francis, Paige, and Lloyd's (2013) investigation provided more specific examples of the ways students reacted from their outdoor experiences: describing nature's beauty through colour, the presence of various animals, a sunset, plants; and reacting to the various textures and scents. Further support is found in the investigation conducted by Şener et al. (2015), whose results indicated that students' attitudes towards learning science became more positive after experiencing different learning environments, such as the outdoors. These findings suggest that part of identity and practice includes teachers' concept of the curriculum and their approach towards the curriculum. What this may mean for science teachers who include the outdoors is that they may view all curricular objectives as mandatory (such as Zatanna's obligation to fulfill the field study objective) or they may focus upon furthering students' attitudes towards science through outdoor experiences and/or connections to real world examples (such as Shiera and Hal).

In addition, these findings also reify the theory that identity and sociocultural context and activity (or practice) are simultaneous and co-constructive with one another (see Chapter 3.3.6.1). Because the curriculum is specific to Alberta, its sociocultural context to that province is inherent in its creation. That means that any teacher teaching the Alberta curriculum (even if s/he is not an Albertan) will be subject to its sociocultural context because of the nature of that document. Yet, teacher identity interacts with that sociocultural context based on the teachers' understanding of the curriculum document and what it means for their own teaching. This provides a basis for their pedagogical approach to the curriculum, i.e. the way their understanding and value for the curriculum is manifested in their practice. Cumulatively, the way that these areas interact with one another are simultaneous and co-constructive in nature.

Table 8.1

Cross-case analysis results categorized by Big "D" Discourse Themes.

Big "D" Discourse Themes	Zatanna	Shiera	Hal
The identity and conceptions of practice related to curriculum	-responsible towards teacher duties, ex. views fulfilling curriculum requirements as mandatory, regardless of other teachers' actions; this may have led her to including the outdoors since conducting a field study is part of the curriculum	-since the Alberta includes attitudes towards science, she tries to further students' sense of stewardship through inclusion of outdoor settings, so they may develop an appreciation for the natural environment and want to protect it	-connects curriculum content to real world examples such as through newspaper articles so students will deepen their attitudes towards science and further their scientific curiosity
Pedagogical methods	-continually looking for the most effective activities by trying out new ones and discarding those deemed inferior, ex. repeatedly uses the winter field study due to its effectiveness upon student learning; this may make her more willing to try other activities such as those that require outdoor settings -develops relationships with students by building trust and respect through mutual	-has a flexible approach to teaching by using a variety of different methods; her flexibility may make her more amenable to trying other ways of teaching and other learning settings, such as the outdoors -values trust and relationships with students; this may lead her to be more willing to use activities that further trust such as outdoor activities where she can get to know students on a	-tries to help students become independent learners by being akin to a guide so students may make connections with the outdoors

	benefits, ex. eating in class; through trust, the students may be more willing to try other activities such as going outside and through trust Zatanna may be able to trust her students to work independently such as in the outdoors	more personal level; also, if students trust Shiera they may be more agreeable to trying other learning methods such as outdoor activities -wants students to have a positive learning experience so she revises activities to increase effectiveness, such as improving upon activities from previous years and using student-designed activities, so they may develop self-confidence	
Goals of science teaching	-values student learning by prioritizing the best setting based upon student enjoyment; this may make her more willing to include other learning settings such as the outdoors	-wants students to value her big picture of science – that nature is amazing (especially during fair weather), occurs in the outdoors, and is part of science; this may contribute to her inclusion of the outdoors since she wants students to have a value for nature	-wants to further students' appreciation of science through inclusion of outdoor settings
The space in which teaching can occur	-any space, regardless of location, is a viable learning setting if students are enjoying their experience; her openness to what is considered a learning	-because she wants students to value nature through appreciation of the natural environment, this leads her to including the outdoors	-values the inclusion of outdoor settings as part of his teaching, feels that only certain knowledge can be obtained from learning while outdoors; this

space may make her more amenable to trying outside learning environments	as a space for teaching and learning	contributes to his view of the outdoors as a viable learning environment where students can get excited about their learning

8.5.1.2 Pedagogical Methods

The second Discourse theme, "pedagogical methods" examines the way the participants teach (see Table 8.1). For instance, there are two outstanding characteristics to Zatanna's pedagogical methods. Because she values student learning, she is continually looking for the most effective activities by experimenting with new ones and discarding those that she feels are less helpful for student learning. Secondly, her value for respect is the foundation for a trust-based relationship with her students. Together, these characteristics may contribute to Zatanna's use of the outdoors by making her more amenable to trying different activities such as those occurring in outdoor settings. Her trust with students may help her conducting outdoor activities because she may be more able to trust them working independently at different locations. Also, building students' trust may make them more amenable to trying activities from Zatanna.

For Shiera, her outstanding pedagogical methods included: valuing a variety of teaching methods, valuing relationships with students, and wanting students to have a positive learning experience. Shiera's pedagogical methods may have contributed to her willingness to incorporating the outdoors. As an example, her preference for using a variety of teaching methods could include her trying outdoor activities. In turn, if students enjoy those activities, this will help them have a positive learning experience, and during those activities Shiera is able to get to know her students on a more personal level (see Example 19 when she describes getting

to know students during outdoor activities). Nedovic and Morissey's (2013) results of students having more intimate conversations with their peers at an outdoor garden support Shiera's view.

Findings from Dhanapal and Lim's (2013) investigation corroborated the implementation of assorted ways of teaching when they disclosed improved academic performance of science students from learning outdoors and indoors. This is what Şener et al. (2015) found when they incorporated a variety of activities such as field excursions (including using the observatory), hands-on, creative drama, and modeling. The effect on their students also included better gains in independent learning, having a more favourable outlook of science, and furthering creative thinking skills. Additionally, Kenney et al. (2003) reported that students were more readily able to use their different learning styles and higher-level thinking skills when learning in outdoor settings.

For Hal, his key methodological method is to help students become independent learners. By having a "guide" approach to his teaching, and in his efforts for students to make connections with the outdoors, these may be methods that favour including the outdoors. Jointly, these results show that pedagogical methods are manifestations of teachers' goals for their students.

Similar to the first Discourse theme, this second Discourse theme of "pedagogical methods" also supports the simultaneous, and co-constructive nature of the relationship between identity, sociocultural context, and activity (or practice) (see Chapter 3.3.6.1). Again, the sociocultural context is the Alberta curriculum, and cannot be ignored since each of these participants are bound by it. The way that the teachers understand teaching and the way that they choose to carry out their practice is part of their identity. The way that they carry out their teaching is an activity. Together, each of these areas interact with one another and cannot be separated. Their relationship is simultaneous and co-constructive.

8.5.1.3 Goals of Science Teaching

The next Discourse theme to Discuss is "Goals of science teaching" (see Table 8.1). All of the participants have a certain style to their teaching to achieve particular goals. For Zatanna, her goal is for her students to learn science in the best way that they can. What this means for her is the best setting possible where students enjoy their learning experience, whether it be in an indoor or outdoor environment. Because she prioritizes student learning to match the best setting, she may be more willing to incorporate outdoor settings than other teachers. Other studies have found that learning can be more effective in settings such as the outdoors. For instance, Dhanapal and Lim's (2013) study of the impact of learning settings for improving students' academic performance found that learning in the outdoors had greater effectiveness than indoor settings. These findings were echoed by Şener, Türk, and Taş' (2015) investigation of a science education project to improve students' attitudes towards science and creative thinking. Their results showed that students' affective learning and cognition were improved by learning in outdoor settings and by more complex projects. An example of improved student learning in outdoor environments is from a study by Fägerstam (2012) regarding teachers' observations of students' experiences in natural settings. In that study, one of the teachers commented that the outdoor environment had their students using more of their senses and ability to visualize, which facilitated their understanding. In addition, students from Ballantyne and Packer's (2009) study of experience-based strategies had greater recall of their excursions in natural environments than teacher-directed activities.

Shiera's main goal of science teaching is for students to value her big picture of science – that nature is amazing. Part of that value results in an attitude of stewardship. That is, if students believe that nature is amazing, then they may have a greater desire to protect the natural

236

environment and that would result in an increased sense of stewardship. Shiera's efforts are supported by other studies where other teachers also wanted to instill in students a desire to care for nature or where the studies found that students developed a stronger affiliation and awareness towards nature. For instance, teachers in Fägerstam's (2012) and Ernst's (2014) study incorporated activities in natural settings in the hopes of their students deepening their appreciation for the environment. This appreciation was seen in the form of students forming a deeper connection to nature by: being better able to value the natural flora and fauna; having emotional responses to nature such as joy, wonderment, happiness, calmness, and freedom; and furthering their environmental awareness (Fägerstam, 2012; Francis et al., 2013; Kenney et al., 2003; Morag et al., 2013). Although these examples are in alignment with Shiera's view of affecting student attitude, the closest match was in a study by (Uitto et al., 2006) who found that positive experiences in nature were influential in students' attitudes toward environmental responsibility. One of the most comparable finding was from Glackin (2013), whose results indicated that teachers with greater success at implementing outdoor activities shared the belief that the outdoors provides a setting for students to apply their knowledge, and further their skill development and environmental awareness. This was also corroborated by Fisher-Maltese and Zimmerman (2015) whose study found that students' attitudes for the environment had become more positive after their outdoor experiences. Further support is found in the investigation conducted by Şener et al. (2015), whose results indicated that students' attitudes towards learning science became more positive after experiencing different learning environments, such as the outdoors.

Similarly, Hal's goal is to also effect student learning but unlike Shiera, he wants students to further their appreciation of science. He tries to achieve that goal by incorporating outdoor environments. In unison, these results appear to show that identity includes goals of science teaching.

Findings from this third Discourse theme also support the simultaneous, co-constructive relationship of sociocultural context, identity, and activity (or practice) (see Chapter 3.3.6.1). The sociocultural context is the Alberta curriculum, since all participants are bound by this document to fulfill the curriculum. The identity aspect is the way that the participants understand teaching and who they are as a teacher. That may be a foundation for them to create their goals of science teaching. The activity aspect is the teachers' practice towards accomplishing their goal of science teaching.

8.5.1.4 The Space in Which Teaching Can Occur

The final Discourse theme is "the space in which teaching can occur" (see Table 8.1), that refers to the type of setting or environment that the participants consider viable for learning. In the case of Zatanna, she considers any space, regardless of location such as indoors or outdoors, as appropriate for learning as long as students are enjoying their experience.

Similarly, both Shiera and Hal consider the outdoors as a space for teaching. Shiera emphasizes the outdoors so students may develop an appreciation for the natural environment while Hal focuses upon students being excited about their learning. Uitto, Juuti, Lavonen, and Meisalo's (2006) study supported the view of the outdoors as places where students can be excited when they found that outdoor activities had the greatest correlation with generating student interest in biology. Other studies described students' excitement for science learning in outdoor environments in the following ways: students would tell their friends in other classes

238

about their experiences, some students shared their lab results with the principal, they would explore by seeing and touching things that they learned about from indoor lessons (Kenney et al., 2003; Luehmann & Markowitz, 2007). Additionally, studies from Dhanapal and Lim (2013), and Morag, Tal, and Keren (2013) found that students enjoyed learning in outdoor settings.

Because these teachers consider the outdoors as a space appropriate for teaching and learning, their consideration may make them favourable towards including outside settings as part of their teaching. In a related study, outdoor environmental lessons were provided by the Watershed Learning Center and participating teachers noted that their students could remember what they had learned at these settings and apply it to indoor classroom lessons (Kenney, Militana, & Donohue, 2003). Together, these studies show that experiencing outdoor environments may contribute towards student learning and that by prioritizing student learning, the outdoors emerges as an important learning environment for these teachers.

These participants see the outdoors as more than just a setting: they see it as a teaching method where students can see direct examples of theory and elevate students' learning. Icelandic education policy documents support this view by referring to the outdoors as a way of increasing diverse methods of teaching (Norðdahl & Jóhannesson, 2015). A teacher from Luehmann and Markowitz's (2007) study agrees with learning in other settings, since their students showed greater comprehension and application of indoor instruction when they were in an environment outside of the classroom. Zatanna, Shiera, and Hal's flexible view of spaces where teaching can occur is congruent with educational policy in Iceland where learning settings are considered to be both natural and manufactured environments (Norðdahl & Jóhannesson, 2015).

Overall, their consideration of the outdoors seems to indicate an inadvertently tense relationship with nature. While they all consider the outdoors as a pedagogical setting and as a teaching method where students can see direct examples of theory and heighten their learning experiences, that consideration indirectly objectifies nature. This is consistent with Hoeg (2016) whose doctoral research described school science practices as discordant from nature. For instance, all of my participants incorporate outside experiences partly to fulfill curriculum requirements. By assessing students based on what they learned from their experiences, this inadvertently shows value towards beholding nature as what may be on some form of assessment, such as a test or lab report,. That is, valuing nature in relation to the curriculum (Hoeg, 2016). Zatanna exemplifies that value by using learning effectiveness as a determining factor for whether an outdoor activity will be repeated for future classes. Shiera's indirect objectification lies in the way students are taught to view nature as something separate. Because she wants her students to appreciate nature through stewardship, this indirectly imparts the notion that nature is separate and "over there", such as protecting a park or wetland or other area, rather than "over here". Contrastingly, Hal appears to be the only participant who has a more harmonious relationship with nature. Although he considers outdoor environments through a pedagogical lens, he expands that lens with a scientific view. Since his goal is for students to view science as being anywhere and everywhere, this imparts a view that nature is in the same state because science and nature cannot be separated from one another.

Echoing results from the previous themes, this last Discourse theme is another support for the simultaneous and co-constructive relationship between sociocultural context, identity, and activity (or practice) (see Chapter 3.3.6.1). Similar to other themes, the sociocultural context is the Alberta curriculum, and Alberta itself since the participants teach in that province. Identity

refs to the way that the participants understand teaching and teaching environments. Their understanding is a foundation for the kinds of spaces they would regard suitable for teaching. Activity is in reference to their teaching that occurs in the spaces they consider appropriate for teaching. Together, the sociocultural context, identity and activity cannot be separated from one another.

8.5.2 Summary

This chapter section has presented Discourse for each of the participants as well as a cross-analysis among them. Findings from the cross-case analysis seem to unite the participants, that is, the findings may be initial evidentiary support for a common Big D among biology teachers who integrate the outdoors. Their shared Discourse includes understanding teaching and pedagogical practice to the degree where they look at different settings and ways of communicating through an educational lens. For teachers who share this Discourse, they understand and view learning settings to be any site from a traditional classroom to a national park and other environments. They also have a flexible view of teaching practices where any form of communication can be used as a teaching method, such as a nature walk, or using photography to capture images as an example of theory.

A common Discourse for this group of biology teachers provides further insight into the relationship between teacher identity and practice. It is important to note that their Discourse is not dominated by strategies or specific reasons for using the outdoors. Rather, their view of science and science teaching is inclusive of the outdoors. Their science teaching results in integrating the outdoors because of their perspective and understanding of science. The notion of teaching practice flowing naturally as a result of teacher identity is commensurate with Enyedy, Goldberg, and Welsh's (2006) finding that practice and identity are intertwined in a way

241

where they must be considered co-constructed or simultaneously. Those sentiments are echoed by Carrier et al. (2013), whose results indicated that teaching practice is influenced by personal and professional beliefs. For these teachers, the outdoors is more than an alternative to an indoor traditional science classroom, it is where science happens, where examples of theory can be found and applied, where students can deepen their attitudes and further their appreciation of science. This Discourse may also help to potentially recognize other like-minded teachers, i.e. those who have the same understandings of teaching methods, learning environments and affecting student attitudes when integrating the outdoors.

8.6 Reflection

This section reflects upon a few different areas including the method, validity and limitations of the study. Reflection upon the method considers the initial motivation for pursuing this research topic, other ways of examining language, and the emphasis upon participants' voices. The next sub-section addresses the validity of the discourse findings followed by the limits of this investigation.

8.6.1 Reflection: Methodology

The original motivation for this research was to examine biology teacher identity in terms of the way they incorporate the outdoors and specifically, their best examples of using the outdoors. There were a couple of limitations. For instance, it was not possible to witness their best outdoor experiences since these occurred at various times of their career. Additionally, it is not possible to directly examine identity since it is not tangible. To ameliorate this, a representation of identity was examined. Language was considered to be the best representation of identity as it

would allow participants to further explain their thoughts and would represent their teaching practice in ways that they may not be directly aware of.

A few different methods of examining language as a representation of identity were considered. Narrative for example, was considered but as this involves the author's journey, this was not deemed useful for capturing the participant's voice as much as possible. Metaphor was contemplated as a support for discourse findings but, metaphors are limited to a narrow view of their source, which was somewhat constrictive compared to findings from the Gee (2011a, 2011b) discourse analysis used. Similar to a metaphor, a pictorial representation of what the participants thought of as teaching was considered but, there was no way to account for the differing levels of visual expression. Instead, language is an equalizer where each participant would be comfortable using language to express their teaching experiences.

Since one of the goals of this research was to explore the connection between teacher identity and practice, it was important to emphasize the voice of the participants. An appropriate method for this endeavour was to use Gee's (2011a, 2011b) discourse analysis. The Big "D" Discourse Tool is valuable for combining all the small "d" discourse tools to form one overall and coherent picture of the identity of biology teachers who use the outdoors. Without Big "D" Discourse, there would only be a disjointed summary of each of the teachers' identities. This method allows for the voice of the participants to be as direct as possible when discussing their experiences.

8.6.2 Reflection: Validity

A multiple case study also aids in maximizing the validity of the study. To construct validity, Yin (2013) describes using a few tactics: using multiple data sources (so that lines of inquiry may converge with one another); establishing evidence in a logical order (this may be significant while collecting data); and using participants to review a draft of the case study.

Internal validity can be considered from two different perspectives. The first view comes from Merriam (1998) who considers internal validity as whether the research findings match reality and to maximize it, researcher's biases need to be accounted for. That is, researcher biases are to be made clear, i.e. acknowledging biases will help investigators ensure that they are studying what they think they are. The other perspective is from Yin (2013) where the particular problem of internal validity is: if the data are correct; whether any rival theories or explanations were addressed; if the evidence converges with one another; and if the evidence is concrete. A third view is from Lincoln and Guba (1984) who use the term "credibility" instead of "internal validity."

In contrast, external validity is "the extent to which the findings of one study can be applied to other situations" (Merriam, 1998, p.207), or can be generalized (Yin, 2013). This is referred to as "transferability" by Lincoln and Guba (1984), as opposed to external validity. The following strategies were used: rich, thick description and multiple cases. Merriam (1998) also explains that this type of description helps readers to reflect upon their own experiences to decide if the results can be transferred to other contexts—a highly detailed description reveals the factors involved, which would increase the applicability of this situation to other settings. Furthermore, multiple cases enhance external validity because they reveal how the results can be applied to more than one situation. For this study, each participant is considered a single case

study and since there was more than one participant, the entirety of the data is a collection of cases, i.e. a multiple case scenario.

An area related to validity is to show rigor in the research. According to Harrison et al. (2017), this is shown in a case study by aligning the philosophy and methodology with each other. They posit that the alignment is important for guiding the design of the study, and the collection and analysis of data. It contributes towards a justified framework, reliability, validity, credibility, and trustworthiness of the data.

8.6.3 Reflection: Validity in Discourse Analysis

The different criteria that indicate a valid discourse analysis were discussed earlier in Chapter 4. The following few paragraphs examine the validity of the discourse analysis undertaken in this study.

From a previous chapter, Gee (2011a) posits that there are four areas to consider when deciding whether a discourse analysis is valid. He (2011a) emphasizes that the more the analysis can answer each of the tools, the greater the validity. The first area is convergence, which correlates greater validity with greater sources of support for the same result (Gee, 2011a, 2011b). According to Gee (2011a) convergence equates with validity, "because it is highly improbable that a good many answers to 42 different questions…additional data sets, and the judgments of "native speakers" and/or linguists will converge unless there is good reason to trust the analysis" (p.124). Discourse analysis in this study emphasized convergence by presenting and discussing tools that either supported one another or showed the same result. An example is shown below in the following table (for further examples, refer back to Chapters 5-7),

Table 8.2

Examples of converging discourse tools that supported an aspect of teacher identity. (For further examples of convergence, see the results chapter for each participant.)

ASPECT OF TEACHER IDENTITY	CONVERGING DISCOURSE TOOLS
Zatanna considers the curriculum as mandatory when teaching	• The Connections Building Tool and repetition (via The Cohesion Tool—a grammatical tool) (Example 7 lines 1-6) indicates Zatanna's view that all Biology 20 teachers should fulfill the curriculum. • The Activities and Identities Building Tools also show that Zatanna views the curriculum as mandatory.
Shiera is willing to try other teaching methods.	• The Activities and Identities Building Tools (as supported grammatically through repetition via The Cohesion Tool) indicate that Shiera tries other ways of teaching (Example 17). • The Social Languages Tool also represented her willingness to incorporate multiple teaching methods.
Hal prefers to guide students' learning as opposed to providing direct answers.	• The Activities and Identities Building Tools show that Hal's language positions students as novices in order to guide their learning (Example 31 and 32). • One characteristic of Hal's teaching is to guide student learning (as revealed by The Figured Worlds Tool). This was supported grammatically through repetition (from The Cohesion Tool).

The above table presents convergence for each participant.

Gee (2011a, 2011b) also adds that the second area of validity is agreement, where members and/or speakers of the d/Discourse agree with the results. Earlier in this thesis I had mentioned part of my past experiences that are pertinent to this research investigation. As a former high school biology teacher who incorporated the outdoors, I concur with the findings of this study, particularly those from the cross-case analysis. As an example, I enjoyed using a variety of teaching methods and learning settings. Also, whenever I incorporated the outdoors, I found my students to be more enthusiastic about their learning, more curious about the connections between science and the outdoors, and overall, they had a greater appreciation of

science. This aligns with the teachers from this study who all used the outdoors to affect students' attitudes. To gain further support for validity in agreement, an additional study could be conducted in the future. In this future study, feedback from other biology teachers who use the outdoors would be sought. They would be presented with these findings and asked whether they agree. If other discourse analysts and other researchers (ex. ethnographic researchers) agree with the results, then the analysis is more valid.

Coverage is the third area of validity and this demonstrates how well the analysis can be applied to related data. To determine whether there was support for coverage, quotes from other studies that had teachers who brought their students outdoors were used. These quotes were then examined for any similarity to the conclusions in this study. A few examples were found, and the first example is a study by Fägerstam (2012) who examined teachers' perspective of students' experiences of learning in natural settings. One of her results indicated that outdoor experiences help students learn about their local ecology and in turn, this may assist in developing a sense of national identity. She used the following quote from one of the teachers to support her claim:

> So, when they can see it, they understand what people are talking about and you know like laughing like a kookaburra, when they see it and they can hear it laughing, they get it. And so, taking them outside and allowing them to see the different things that might hear people talk about or at least they know what is around them and that gives them a sense of belonging I suppose because they know what it is, and they understand but also gives them power because they have a little bit more control now.

However, using the theoretical framework from this study as a guide, the above quote seems to be using the outdoors as a learning setting so that students may apply theory to the outdoors, such as becoming familiar with the sound a kookaburra makes. This view aligns with a similar

conclusion from the cross-case analysis and with Hal who tries to have his students connect science with the outside world.

Another example is a report by Kenney et al., (2003), in which they assessed the Watershed Learning Center Program. To describe their results, they used a series of teacher comments about the effect that this program had on their students including: "The outdoor lessons helped students, 'understand scientific method and field experience;'" "The students became 'nature detectives' and were aware of 'hidden information' or things 'that are not so obvious;'" "The students could engage in guided discovery learning which allowed them to 'attach the information to their own schemas'," "The students became effective observers in the field. They learned about the connections between all life," "This program was perfect! The kids loved it and it reiterated several important concepts from our pond unit in science class," and "The most beneficial part of the program was how well the material covered in the park related to what was learned in the classroom. The children could see real examples of earth materials in the area around them." However, from the context of this research investigation, these quotes seem to have a common feature such as the way that outdoor experiences helped students learn science. This resonates with the cross-case analysis results where the teachers' understandings of learning environments are that any setting could be used for learning, especially the outdoors. The specific skills gained from outdoor experiences from these quotes relate to results from Hal whose identity includes relating learning certain content in certain settings.

An additional example supporting validity coverage for this investigation is from Luehmann and Markowitz's (2007) study of science teachers' view of the advantages of using an off-campus learning setting. Their findings indicate that teachers valued bringing students to a

university medical school laboratory and as support, they used the following quote from a

teacher who described students' excitement while learning in a setting completely different from

their school:

> …the setting was new…they were on unfamiliar grounds—the impression was
> captivating because this was a university, in a real lab with…equipment all over the place.
> That whole environment is so conducive to 'Oh Man! This is really neat!' I mean they
> came back…totally flabbergasted!

Because the sentiment of the quote emphasizes student excitement, this relates to results from the

cross-case analysis, specifically, using the outdoors as a setting for students to foster their

attitude towards science. Although the previous quotes are used in other studies in a different

way, applying the conceptual framework from this investigation to view these quotes provides

further support for validity coverage.

Linguistic detail is the last area of validity according to Gee (2011a), which is how well

the analysis and linguistic structure are related to one another. That is, the greater the findings

relate to the wording of a social language, the greater the validity. Earlier results (Chapters 5-7

focus upon linguistic detail so that the analysis is structural. The discourse tools were applied to

carefully draw inference from structural patterns. The following table provides an example of

linguistic detail for each participant. (For other examples of linguistic detail, refer back to the

results section of each case, Chapters 5-7.)

Overall, support was provided for each of the four areas of validity according to Gee

(2011a). However, the second validity area of agreement would be strengthened with more

supports but, a future study may be needed to achieve that endeavor. Otherwise, the areas of

validity for this study have multiple sources of support.

Table 8.3
Examples of linguistic detail.

ASPECT OF TEACHER IDENTITY	LINGUISTIC DETAIL
Zatanna: Collocational patterns in her social language indicate the situated identity of a biology teacher who may be a biology specialist (see Example 11).	• Naming of specific courses (Biology 20 and 30) (Example 11, lines 1-3) • Naming specific tasks undertaken by students, ex. collecting or taking pictures of samples, analysis (Example 11, lines 1-2) • Using biology terminology, ex. Gitxsan classification, biological classification, abiotic and biotic factors, stage of succession (Example 11, lines 1-3)
Shiera: Her social language has a collocational pattern that emphasizes natural settings (see Examples 24-27).	• Particular vocabulary highlights the natural outdoors, ex. field study, natural area, Strathcona Wilderness Center, forest, plants or bugs, flowers, and bugs (Examples 24-27). • Repetition of particular words, such as flowers and bugs (both repeated twice) stresses natural settings (Examples 24-27).
Hal: He enacted the identity of a biology teacher on a field trip with students, the kind of teacher who is observant of their behaviour, and this was indicated from collocational patterns in his social language (Example 36).	• Certain vocabulary and phrases co-locate with one another that seems to portray a biology teacher on a field trip with students (Example 36): students (line 1); the trip (line 1); the museum (line 2); they didn't want to leave (line 4); take and them out (line 5). • In the context of his description of taking students to The Royal Tyrrell Museum, his language focuses upon students' excitement instead of their learning (Example 36): they took a lot of pictures (line 1); they were bragging to their friends not on the trip (line 1); and they didn't want to leave (line 4). • To highlight the frequency of students' excitement during outdoor activities, the phrase "every time" was used.

8.6.4 Reflection: Researcher's Position

With respect to research design, the author's position needs to be considered as a source of influence. Prior to discussing positionality, position must first be discussed. According to Glesne (2011), positions "refer to aspects of one's person that are not necessarily embodied in the person and include both ascribed characteristics (nationality, ancestry) and achieved characteristics (educational level, economic level, institutional affiliation, etc.)" (p.157). Furthermore, to inhabit a position is the intersection of those characteristics with the socio-cultural-historical context. To apply that notion relative to a research project or to the research participants is positionality; that is, someone's position in relation to someone else (Bourke, 2014). In addition, Glesne (2011) cautions that researchers need to be aware of their subjectivities such as acknowledging their social position both as individual and members of various groups.

Another significant aspect of positionality is its fluidity. One representation of its fluidness is that positionality cannot be controlled because it is determined by interaction with others. However, researchers can affect those interactions by their attitude towards their research, such as having an open mindset and allowing the data to speak for itself, instead of trying to confirm previously held beliefs and opinions. Other factors showing the fluid nature of positionality include the fact that relationships change with time and with the people involved.

In terms of political beliefs and social class, it is doubtful that these factors played a role in this study since the interview questions and analysis were not concerned with either of those areas.

Since I was the only analyst and collector of the researcher data, my subjectivity is implicit throughout my study. That concurs with Dwyer and Buckle (2009) who emphasize the

importance of the researcher's position since she or he is solely or at least a large part of the data collection and analysis. To the participating teachers, I was the researcher as a doctoral student. Research objectivity may be complex since each of the participants were familiar with the doctoral supervisor at the time, and a previous relationship was held with Shiera (she had taken a graduate class with the researcher).

My secondary school teaching experiences contributed towards me being an "insider" with my research participants. By sharing a common language, experiential base, and identity with my participants, I am also a member of the group that I am researching (Dwyer & Buckle, 2009). They describe one benefit of this situation: participants may be more accepting of me and in turn, may be more forthcoming with details in their responses. That benefit may lead to richer data or the participants may skip over details believing that I do not need them since I am an "insider." Yet, it is possible that my familiarity could also lead me to skip over details, especially to someone who is an "outsider" and unfamiliar with teaching and/or incorporating outdoor environments. Being an insider also means that I am biased towards incorporating outdoor settings with biology teaching. Due to the positive experiences I had of including outside environments with my teaching, I support the use of those kinds of learning settings.

Other than being an "insider," my role as researcher also makes me an "outsider." While I share similar experiences and can relate to my participants, I cannot be fully engaged as an inside member due to my researcher responsibilities of collecting and analyzing data (Dwyer & Buckle, 2009). There is a tension in my roles that is commensurate with qualitative research. For Dwyer and Buckle (2009), qualitative researchers cannot be distant researchers since they are intimately involved with their study due to being the primary instrument for data collection and analysis. In other words, qualitative researchers occupy a space between researcher and

member of the group being studied. While not all qualitative researchers may be "inside"

members, this does not change the notion of the intimacy and involvement that those researchers

have with their study process.

As a researcher, I have an overall qualitative view of my study. Because I am exploring

the relationship between teacher identity and practice by using case study, I am sensitive to the

uniqueness of that relation, i.e. each teacher's link between their professional identity and

teaching may be specific to that teacher. Honouring such uniqueness through case study

contributes to my emphasis upon participants' views and relativist stance, since each case may

be considered as one reality and multiple participants represents multiple realities (Yin, 2013).

Another researcher view is that I consider identity as co-constructed with discourse, sociocultural

context, and practice (or activity). That view reifies my postmodern perspective on identity that

there are influences upon self-authored identity. Cumulatively, my positionality resonates most

with Gee since he also emphasizes participant voice, sociocultural context, and relativist and

postmodern views.

I acknowledge that my relationship with my research, my support for using outdoor

environments, and my understanding of how students learn science temper this research

investigation. These sentiments align with Bourke (2014) who describes the researcher's voice

and positionality as embedded within the research project, and his/her reflections influenced by

the research process, including participants. The significance of describing my context supports

the postmodern view of identity (acknowledging the socio-cultural-historical context upon

identity) used in this dissertation.

8.6.5 Reflection: Limitations

The focus of this research investigation is to explore: biology teacher identity and their practice of incorporating the outdoors as they are represented by discourse; the relationship between teacher identity and practice; and whether there is a common Discourse shared by these teachers. However, there are a couple of areas that this study is unable to reveal.

One area is the geographical, cultural, and curricular limitation of Alberta. For instance, the participants are quite similar since they are all Albertan teachers who have experience teaching the same curriculum for the same courses (Biology 20 and Biology 30) in central Alberta. Since they share several commonalities, the corollary is the possibility of different discourses of the outdoors that may not apply among these Albertan teachers. As an example, there may be other schools where secondary students do not have the opportunity to experience science learning in outdoor settings due to administrative constraints, cultural reasons, and other justifications.

Another limitation is the data source of this research investigation. Because all of the data came from the teachers, the researcher was limited to second-hand information as opposed to directly observing their teaching practice, such as how they interact with their students. In addition, this study cannot engage with what the teacher practices directly look like. For example, since students and their reactions were not directly observed by the researcher, the results are limited to participants' memories.

These limitations may be used to inform future studies that could involve teachers outside of Alberta and its curriculum, and potentially include first hand observations by the researcher. This would provide a more robust description of a shared Discourse among biology teachers who incorporate the outdoors.

8.7 Conclusion

This study explored the relationship between the identities of biology teachers and their inclusion of natural settings with their practice. A theoretical framework of identity was essential for specifying the way it was considered in this dissertation. To provide context for the connection between identity and the outdoors, I turned to the literature. As a corollary, describing that connection contributed to narrowing the type of participants most appropriate to this research. For instance, biology teachers who used the outdoors as both a concept and context, such as for multidisciplinary learning in natural and constructed landscapes that expand upon indoor classroom instruction (Auwer, 2006; Ford, 1986; Rickinson et al., 2004; Woodhouse & Knapp, 2000). With respect to identity, the participants are biology teachers who have experience integrating outdoor activities and can discuss in detail their understanding of themselves as a science teacher, their practice, and their view of science.

Both the theoretical framework and literature review were vital for creating the main research question and sub-questions: (1) What is the relationship between the identities of biology teachers and integration of the outdoors? (1a) In what ways does identity influence biology teachers' pedagogical decisions towards their outdoor practice?; (1b) In what ways do biology teachers' identities and outdoor practice influence each other? The answers to these questions will help educators and others better understand the ways that teacher identity guides practice as manifested through discourse such as, biology teachers' identity guiding their incorporation of the outdoors, and to re-consider the relationship between science teaching and the outdoors. In addition, answering these questions may help teachers be more aware of their identity and in turn, that awareness may contribute towards greater control of their practice

(Enyedy et al., 2006). To gather data for answering these questions, a questionnaire and two interviews were conducted. Discourse was used as an analytical framework to generate results.

In exploring the relationship between teacher identity and practice, common coherences (i.e. a joint Discourse) were found among the participants. The key elements of that shared Discourse include having a flexible view of teaching and pedagogical practice, which leads the participants to examine other locations and ways of teaching from a pedagogical perspective that lead to integration of the outdoors. Their Discourse is not directly about the outdoors but rather, viewing and understanding science and science teaching in a way that is inclusive of the outdoors. For these teachers, science teaching naturally leads to implementing the outdoors so that their emphasis is on teaching science that includes the outdoors rather than teaching the outdoors that includes science.

As part of the exploration of the main research question, the influence of identity upon pedagogical decisions concerning teaching practice was also illuminated. For each of my participants, their identity impacted their choices in the way that they taught biology. As an example, Zatanna's values for fulfilling curriculum objectives, student learning, and mutual respect influenced her to include outdoor learning environments, e.g. fulfilling the field study curriculum objective, prioritizing the learning benefits of a setting so that students may understand theories and concepts, and trusting students to work independently other than within the classroom, respectively. For Shiera, her proclivity for variety, value for relationships with students, and care for the natural world appear to support her integration of the outdoors by trying additional learning settings, such as the outdoors, her willingness to incorporate activities and settings that further those relationships and providing positive experiences in these settings so her students may develop an appreciation and care for the environment, respectively. For Hal,

his pedagogical view of the outdoors, and desire to increase students' attitudes towards science seem to assist in his incorporation of the outdoors through considering the outdoors as the best setting for learning certain content and using the outdoors so students may directly observe scientific processes and experience real learning while outdoors to further their enthusiasm for science.

Another aspect of the main research question is the way that teacher identity and practice influence one another. For all of my participants, they continued to incorporate outdoor settings because of the positive reactions they had observed from students. In particular, Zatanna directly commented that due to those positive reactions, she continued to include the outdoors, even when it was not a curriculum requirement. Shiera was the only participant who observed negative reactions from students, ex. when she brought students outside during winter, and because of those reactions, she no longer used winter environments as part of her teaching. Those pedagogical decisions of my participants align with findings from Glackin (2013), whose study results indicated that "perseverance and repetition of outdoor practice resulted in increasingly more positive teaching experiences" (p.209). As further support, Wallace and Kang (2004) cited a study reporting that teacher beliefs were salient to their practice.

8.8 Newness of Findings

This section will highlight the newness of the findings to the literature from this study. One contribution to the field is the further exploration of the relationship between identity and practice of teachers. From Avraamidou's (2014) review of science teacher identity literature, she identified a gap in the literature, "left largely unexplored from existing literature is an exploration of how science teacher identity is put into practice, or how identity is enacted in

school classrooms" (p.165). This study addresses this gap by specifically relating identity characteristics that aided in teachers' implementation of outdoor settings (see Table 1). Findings demonstrated specific aspects of each participants' identity that led them to incorporating the outdoors. Results from the cross-case analysis illuminated coherences, such as having a fluid view of teaching methods and learning settings.

Another original contribution of this study is its longitudinal data. An additional shortfall in the literature are longitudinal studies that span years and contexts (Avraamidou, 2014). Her findings indicated that most studies only discussed a small amount of experiences over the course of a semester and that most studies had a short duration. Because the data gathered in this study is from the participants' experiences over the course of their career, ex. Zatanna's experiences spanned seven years; Hal's spanned 12 years; Shiera's were over a 26- year span (see Chapter 4), their experiences have a longitudinal quality to them. The corollary is that connections between their identity and practice are also inherently longitudinal. Therefore, there is a long-term relationship between identity and inclusion of outdoor environments with biology teaching among my participants.

An additional unique input are students' responses to their teachers' identities of including outdoor learning settings. While Dowd's (2009) study used a similar pedagogical approach to mine (see Chapter 2), his results did not look at the way students responded to outdoor science educators' teaching identities. Although this was not the focus of my study, each of the participants in my study described the positive reactions they had received from students when learning outside. That may be considered as a response to their teachers' identity.

In sum, findings from this study have made a few unique contributions to the literature. For instance, a deeper exploration of the relationship between teacher identity and practice,

specifically, biology teachers' identities and their inclusion of the outdoors. And an examination of longitudinal data of that relationship contributed to the literature. A final addition to the existing literature are students' responses to teacher's identities of incorporating the outdoors with their biology teaching.

8.9 Implications for Practitioners, and Stakeholders

A potential extrapolation of this study's findings is its implications for practitioners, policy, and stakeholders.

From this study's findings, one possible implication for practitioners is to have a stronger framework to guide their practice. Because this study is an exploration into the relationship between identity and practice, and that they co-construct one another, it would seem that a teacher having greater awareness of her/his identity through possibly self-reflection would lead to a more structured framework for their practice. This resonates with Enyedy et al. (2006) who relate awareness of teaching identity to adapting or revising their current teaching practice. In the context of this study, this would mean that teachers who are more cognizant of their identity would be better able to pedagogically incorporate the outdoors than presumably other teachers who may be less aware of their identity.

One more implication for practitioners is that findings from this study may also contribute towards expanding and enriching the way science and the outdoors are viewed. As an example, teachers' views of biology and the outdoors may be deepened. Because identity and practice are reflections of one another, affecting teacher identity could be manifested in practice (Sachs, 2001). If teachers reconsidered their understandings of biology and biology teaching to include the outdoors, then potentially their practice might include more outdoor activities since

these are determined by their decisions and understandings of how to approach teaching (Coldron & Smith, 1999; Schneider, 2007; Tobin, Tippins, & Gallard, 1994). For instance, Hal's view of "science is everywhere" (Examples 30 and 33) appears to have supported his integration of the outdoors as represented through discourse. However, the corollary is that his view could have been reified through his practice of integrating the outdoors. Avraamidou's (2014a) study on the role of informal science environments upon science teacher identity supports this view. She found that the use of these environments (which include the outdoors) can contribute towards a teacher's view of science, such as furthering their understanding of: nature of science, science inquiry, the relationships between science and society, and scientific work. In contrast, there may be teachers who do not incorporate the outdoors because of their understandings of science teaching. From Example 7, Zatanna mentioned that not all teachers at her school incorporate the outdoors and this could be due to the way they comprehend what science teaching is for them and who they are as a science teacher. If these teachers do not incorporate the outdoors, it is possible that this reified their lack of using outdoor settings.

Another extension of results from this study is upon stakeholders, such as teacher educators. By further exploring the connection between a teacher's practice and their identity, teacher educators may benefit from placing a greater emphasis upon identity as an aspect of professional development, which could help teachers expand and evolve their practice. In contrast to Glackin's (2013) study, which examined the effect of a professional development program of outdoor science upon teachers, my study focuses upon the effect that identity and practice have upon one another. Since the way that my participants view and understand themselves as biology teachers naturally led them to incorporating outdoor settings, their use of

the outdoors reified their identity to continue to incorporate those settings. This may help teacher educators focus upon identity as one way of aiding teacher practice.

In addition, if the outdoors could become a part of the discourse of viewing and understanding science, then it may become part of the formation of science teacher identity. This appears to espouse a specific view of science but, other views had been supported from different studies. Other orientations in science education, such as science, technology, society and environment (STSE) also have distinct views of science (Pedretti, Bencze, Hewitt, Romkey, & Jivraj, 2008). These views are not restricted to science but may extend to contributing towards their teacher identity. As an example, Pedretti, Bencze, Hewitt, Romkey, and Jivraj's (2008) made some recommendations for pre-service teacher education programs so that "a science teacher identity that is inclusive of the norms and practices of STSE education" may develop. In a study by Akerson, Pongsanon, Weiland, and Nargund-Joshi (2014) as a different example, they examined teacher identity development "as an elementary teacher of nature of science" (NOS). In her efforts to emphasize NOS she would use specific resources designed for this purpose and would incorporate NOS in each science lesson throughout the school year (Akerson et al., 2014). In other words, she was highlighting a specific view of science that she was incorporating into her science teaching. This is congruent with teachers from this study where their views of science (integrating the outdoors) guided their teaching practice. However, the difference between the teacher from Akerson et al (2014) and those in this study were subtle. Teachers in this study did not see themselves as directly embedding the outdoors or specifically trying to incorporate the outdoors to stress its importance. Rather, these teachers prioritized a view of science that is inclusive of the outdoors. In contrast, the teacher from Akerson et al (2014) study highlighted NOS methods. Overall, teachers from both studies emphasized a specific view of

science. Focusing upon specific views of science will help preservice science educators broaden their view of science education.

Moreover, this study's findings may also contribute to various pre-service and in-service teacher programs. Internationally, this view is complementary to the components of outdoor learning in Estonia that include communication, multi-sensory experiences, independence, and reflection (Sarv & Vilbaste, 2008). It is also congruent to Norwegian outdoor education that uses an interdisciplinary and activities-based approach for outdoor activities (Jordet, 2008). On a national level, their view aligns with outdoor education programs at Queen's University (2009), Lakehead University (2009), and University of Regina (2016) where their programs support multidisciplinary, multisensory, and activities in outdoor settings. However, science education is rarely mentioned solely with these programs and instead, is considered as one of the many subjects that can incorporate outdoor settings. Findings from this study can be used to further these programs' views so that not only do outdoor settings incorporate multiple subjects but these subjects, especially science, incorporate the outdoors. To extend this notion, if the outdoors was taught as part of science and science teaching instead of as a teaching tool, maybe future science teachers would be more inclined to incorporate outdoor settings.

One more implication of this research is for curriculum developers. For instance, part of Shiera's Discourse is for students to become future stewards of the natural environment. This notion extends past the Alberta curriculum and may be suggestive for curriculum developers to have a more flexible view of other science attitudes and views of learning settings.

Overall, findings from this study contribute towards further developing teacher practice. This may be attempted through cognizance of identity as it relates to practice by either personal reflection or guided by teacher educators.

8.10 Future Research

Results from this study explored teacher identity, the relationship between identity and practice, and key elements of a common Discourse among biology teachers who integrate the outdoors. They have a pedagogical lens when viewing the world outside of the classroom so that the outdoors can complement indoor classroom instruction by providing examples and applications of theory, providing a setting for scientific investigations, furthering students' attitudes towards science and conservation through increased enthusiasm and independent learning, and facilitating social relationships between teachers and students. Their Discourse indicates that the way that they understand science and science teaching is inclusive of the outdoors.

Teachers may reconsider their understandings through reflection. If teachers were more aware of their discourse about their teaching practice by reflecting upon it, this may influence their future practice. As an example, in one part of Zatanna's interview (not included in the analysis) she does not think that the outdoors is significant to her teaching. However, her discourse seems to indicate that she values the outdoors as a viable setting for learning biology, to get students excited about learning, and for fulfilling curricular objectives. If she were aware of her discourse and how it represents her pedagogical value for integrating outdoor experiences, it may help to further develop her practice, specifically inclusion of these experiences. Further research is needed on the ways that reflection may influence science teachers' practice towards including outdoor learning environments with their teaching.

Another application of this research could be applied to other studies to inform future investigations. For example, Hazari, Cass, and Beattie's (2015) study of physics teachers in terms of their identity, positioning, and student engagement may be extended to an outdoor

setting in a future study. Although their focus was upon teachers of a different subject discipline, some of their participants' values align with those from this study. Specifically, they are both described as recognizing the outdoors as a contributing factor towards student engagement and as a rich environment for accomplishing change in roles. If their study was replicated but with an emphasis upon outdoor experiences, there may be further implications for physics teacher identity development.

Future studies that explore the relationship between science teacher identity and inclusion of outdoor learning environments may want to consider either a quantitative or mixed methods approach where a larger sample size of participants can be used. One of the limitations to this study is that there were only a few participants. By expanding the quantity of participants, it is possible that this will better illuminate any coherences among those educators. In that way, more detail may be revealed when trying to describe biology teachers who incorporate the outdoors with their practice.

8.11 Final Thoughts

The aim of this study is to explore the relationship between the identities of biology teachers and their integration of the outdoors. The three case studies offered identity characteristics, such as having a flexible view of learning environments and teaching methods that contributed to including outdoor environments with teaching. The cross-case analysis showed evidence of commonalities indicating a shared Discourse where other settings and ways of communicating are considered from a pedagogical lens. It is suggested that further investigations upon those commonalities may lead to greater inclusion of the outdoors with science teaching.

This study provides a deeper exploration into the relationship between biology teacher identity and their practice of including outdoor settings or more generally, between teacher identity and practice. Hopefully these findings will be a foundation for more teachers to incorporate outdoor learning environments.

REFERENCES

Adkins, C., & Simmons, B. (2003). Outdoor, experiential, and environmental education: Converging or diverging approaches? Retrieved April 5, 2009, from Eric Digests: http://www.ericdigests.org/2003-2/outdoor.html.

Airey, J., & Linder, C. (2009). A disciplinary discourse perspective on university science learning: Achieving fluency in a critical constellation of modes. *Journal of Research in Science Teaching*, *46*(1), 27-49.

Alberta Education. (2009). Biology 20-30. Retrieved from http://education.alberta.ca/media/654841/bio203007.pdf

Akkerman, S.F., & Meijer, P. (2011). A dialogical approach to conceptualizing teacher identity. *Teaching and Teacher Education*, *27*, 308-319. doi:10.1016/j.tate.2010.08.013

Akerson, V. L., Pongsanon, K., Weiland, I. S., & Nargund-Joshi, V. (2014). Developing a professional identity as an elementary teacher of nature of science: A self-study of becoming an elementary teacher. *International Journal of Science Education*, *36*(12), 2055-2082.

Association for Science Education and Outdoor Science Working Group (ASE OSWG). (2011). *Outdoor science*. Shrewsbury: Field Studies Council and King's College London.

Atencio, M., & Tan, Y. S. M. (2016). Teacher deliberation within the context of Singaporean curricular change: pre-and in-service PE teachers' perceptions of outdoor education. *The Curriculum Journal, 27*(3), 368-386. doi:10.1080/09585176.2015.1127843

Auwer, M. (2006). The five senses approach to outdoor experiential learning. *International Journal of Learning, 13*(5), 163-166.

Avraamidou, L. (2014). Developing a reform-minded science teaching identity: The role of informal science environments. *Journal of Science Teacher Education*, *25*(7), 823-843.

Aydin, G. (2015). The effects of computer-aided concept cartoons and outdoor science activities on light pollution. *International Electronic Journal of Elementary Education, 7*(2), 142.

Bakhtin, M. (1986). *Speech genres and other late essays*. Austin, TX: University of Texas Press.

Ballantyne, R., & Packer, J. (2009). Introducing a fifth pedagogy: Experience-based strategies for facilitating learning in natural environments. *Environmental Education Research, 15*(2), 243-262.

Barker, S., Slingsby, D., & Tilling, S. (2002). Teaching biology outside the classroom. *Is it heading for extinction? A report on biology fieldwork in the* 14-19 *curriculum.* (FSC Occasional Publication 72). Shrewsbury, UK: Field Studies Council/British Ecological Society.

Barnett, J., & Hodson, D. (2001). Pedagogical context knowledge: Toward a fuller understanding of what good science teachers know. *Science Education*, *85*(4), 426-453.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report, 13*(4), 544-559.

Beames, S. (2015). Place-based education: A reconnaissance of the literature. *Pathways: The Ontario journal of outdoor education, 28*(1), 27-30.

Beames, S., Atencio, M., & Ross, H. (2009). Taking excellence outdoors. *Scottish Educational Review, 41*(2), 32-45

Beauchamp, C. & Thomas, L. (2009). Understanding teacher identity: An overview of issues in the literature and implications for teacher education. *Cambridge Journal of Education, 39*(2), 175-189.

Blackledge, A., & Creese, A. (2014). Heteroglossia as practice and pedagogy. In Heteroglossia as practice and pedagogy (pp. 1-20). Netherlands: Springer.

Boghossian, P. (2007). *Fear of knowledge: Against relativism and constructivism*. Oxford, UK: Clarendon Press.

Bourke, B. (2014). Positionality: Reflecting on the research process. *The Qualitative Report, 19*(33), 1-9.

Braund, M., & Reiss, M. (2004). The nature of learning science outside the classroom. In M. Braund, & M. Reiss (Eds.), *Learning science outside the classroom* (pp.1-12). London, UK: RoutledgeFalmer.

Carrier, S. J. (2009). The effects of outdoor science lessons with elementary school students on preservice teachers' self-efficacy. *Journal of Elementary Science Education, 21*(2), 35-48.

Carrier, S. J., Tugurian, L. P., & Thomson, M. M. (2013). Elementary science indoors and out: Teachers, time, and testing. *Research in Science Education, 43*(5), 2059-2083. doi: 10.1007/x11165-012-9347-5

Chantrell, G. (2015). *Challenges, as perceived by teachers, to learning outdoors* (Master's thesis). Retrieved from Google Scholar.

Chapman, S., McPhee, P., & Proudman, B. (1992). What is experiential education? *The Journal of Experiential Education, 15*(2), 16-23.

Christie, B. (2012). *The impact of outdoor learning experiences on attitudes to sustainability: A brief review of literature*. Field Studies Council/University of Edinburgh. Field Studies Council Report 06/2012.

Cohen, D., & Crabtree, B. (2006). Qualitative research guidelines project.

Cohen, J.L. (2008). 'That's not treating you as a professional': teachers constructing complex professional identities through talk. *Teachers and Teaching: Theory and Practice, 14*(2), 79-93.

Coldron, J. & Smith, R. (1999). Active location in teachers' construction of their professional identities. *Journal of Curriculum Studies, 31*(6), 711-726.

Creswell, J.W. (2003). Research design: *Qualitative, quantitative and mixed methods approaches* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Daniels, H., Cole, M., & Wertsch, J.V. (2007). Editors' introduction. In H. Daniels, M. Cole, & J.V. Wertsch (Eds.), The Cambridge companion to Vygotsky (pp.1-17), New York, NY: Cambridge University Press.

Davies, B., & Harré, R. (1990). Positioning: The discursive production of selves. *Journal for the Theory of Social Behaviour, 20*(1), 43-63. doi: 10.1111/j.1468-5914.1990.tb00174.x.

Dewey, J. (1938). *Experience and education*. New York, NY: Macmillan Publishing Company.

Dhanapal, S., & Lim, C. C. Y. (2013). A comparative study of the impacts and students' perceptions of indoor and outdoor learning in the science classroom. *Asia-Pacific Forum on Science Learning and Teaching, 14*(2), 1-23.

Dillon, J., Rickinson, M., Teamey, K., Morris, M., Choi, M.Y., Sanders, D., & Benefield, P. (2006). The value of outdoor learning: Evidence from research in the UK and elsewhere. *School Science Review, 87*(320), 107-111. Retrieved from http://www.outlab.ie/forums/documents/the_value_of_school_science_review_march_2006_87320_141.pdf

Donaldson, G. W., & Donaldson, L. E. (1958). Outdoor education a definition. Journal of Health, Physical Education, *Recreation, 29*(5), 17-63.

Dowd, P.F. (2009). *The influence of outdoor science educators' teaching identities on their pedagogical practice* (Unpublished doctoral dissertation). King's College London, London UK.

Driver, R., Asoko, H., Leach, J., Scott, P., & Mortimer, E. (1994). Constructing scientific knowledge in the classroom. *Educational Researcher, 23*(7), 5-12.

Dwyer, S.C., & Buckle, J.L. (2009). The space between: On being an insider-outsider in qualitative research. *International Journal of Qualitative Methods, 8*(1), 54-63. doi:10.1177/160940690900800105

Ebersole, M. M., & Worster, A. M. (2007). Sense of place in teacher preparation courses: Place-based and standards-based education. *Delta Kappa Gamma Bulletin, 73*(2).

Enyedy, N., Goldberg, J., & Welsh, K. M. (2006). Complex dilemmas of identity and practice. *Science Education, 90*(1), 68-93

Ernst, J. (2014). Early childhood educators' use of natural outdoor settings as learning environments: an exploratory study of beliefs, practices, and barriers. *Environmental Education Research, 20*(6), 735-752.

Fägerstam, E. (2012). Children and young people's experience of the natural world: Teachers' perceptions and observations. *Australian Journal of Environmental Education, 28*(01), 1-16.

Fairclough, N. (2003). *Analysing discourse: Textual analysis for social research*. New York, NY: Psychology Press.

Feille, K. (2013). Getting outside: Three teachers' stories of using the schoolyard as an integrated tool for elementary teaching. *Electronic Journal of Science Education, 17*(3).

Fisher-Maltese, C., & Zimmerman, T. D. (2015). A garden-based approach to teaching life science produces shifts in students' attitudes toward the environment. *International Journal of Environmental and Science Education, 10*(1), 51-66.

Flyvbjerg, B. (2004). Five misunderstandings about case-study research. In C. Seale, G. Gobo, J.F. Gubrium, & D. Silverman (Eds.), *Qualitative research practice* (pp.420-434). London, UK: Sage.

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry, 12*(2), 219-245.

Ford, P. (1986). Outdoor education: Definition and philosophy. Retrieved April 5, 2009, from Eric Digests: http://www.ericdigests.org/pre-923/outdoor.htm.

Foster, A., & Linney, G. (2007). *Reconnecting children through outdoor education: A research summary*. Toronto: The Council of Outdoor Educators of Ontario.

Francis, M., Paige, K., & Lloyd, D. (2013). Middle years students' experiences in nature: A case study on nature-play. *Teaching Science, 59*(2), 20.

Gallagher, J.J. (1991). Prospective and practicing secondary school science teachers' knowledge and beliefs about the philosophy of science. *Science Education, 75*(1), 121-133.

Gee, J.P. (2001). Identity as analytic lens for research in education. *Review of Research in Education, 25*, 99-126.

Gee, J.P. (2008). *Social linguistics and literacies: Ideology in discourses (3rd ed.)*. New York, NY: Routledge.

Gee, J.P. (2011a). An *introduction to discourse analysis: Theory and method* (3rd ed.). New York, NY: Routledge.

Gee, J.P. (2011b). *How to do discourse analysis: A toolkit*. New York, NY: Routledge.

Gee, J.P., Allen, A., & Clinton, K. (2001). Language, class and identity: Teenagers fashioning themselves through language. *Linguistics and Education, 12*(2), 175-94.

Gee, J.P., & Crawford, V. (1998). Two kinds of teenagers: Language, identity, and social class. In Alvermann, Hinchman, Moore, Phelps (Eds.), *Reconceptualizing the literacies in adolescents' lives.* (pp. 225-245). Hillsdale, NJ: Lawrence Erlbaum.

Gee, J.P., & Green, J. (1998). Discourse analysis, learning, and social practice: A methodological study. *Review of Research in Education, 23*, 119-169.

Gee, J.P., & Handford, M. (2012). Introduction. In J.P. Gee & M. Handford (Eds.), The Routledge handbook of discourse analysis (pp. 1-6), Abingdon, UK: Routledge.

Glackin, M.A. (2013). *Teaching science outside the classroom: The role of teachers' beliefs and teacher efficacy during a two-year professional development programme* (Doctoral dissertation, King's College London, London, UK).

Glackin, M. (2016). 'Risky fun' or 'Authentic science'? How teachers' beliefs influence their practice during a professional development programme on outdoor learning. *International Journal of Science Education, 38* (3), 409-433.

Glesne, C. 2011). *Becoming qualitative researchers: An introduction* (4th ed.). Boston, MA: Pearson.

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The qualitative report, 8*(4), 597-606.

Goodnough, K. (2011). Examining the long-term impact of collaborative action research on teacher identity and practice: The perceptions of K-12 teachers. *Educational Action Research, 19*(1), 73-86. doi:10.1080/09650792.2011.547694.

Gough, N. (2016). Australian outdoor (and) environmental education research: Senses of "place" in two constituencies. *Journal of Outdoor and Environmental Education, 19*(2), 1-11.

Gruenewald, D.A. (2003). The best of both worlds: A critical pedagogy of place. *Educational Researcher, 32*(4), 3-12.

Hacking, I. (1986). Making up people. In T.C. Heller, M. Sosna, D.E. Wellbery, A.I. Davidson, A. Swidler, & I. Watt (Eds.), *Reconstructing individualism: Autonomy, individuality, and the self in Western thought* (pp. 222-236). Stanford, CA: Stanford University Press.

Halliday, M.A.K. (1985). Dimensions of discourse analysis: Grammar. In T.A. van Dijk (Ed.), *Handbook of discourse analysis: Volume 2 dimensions of discourse* (pp. 29-56). London, UK: Academic Press.

Harrison, H., Birks, M., Franklin, R., & Mills, J. (2017). Case study research: Foundations and methodological orientations. *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research, 18*(1), Art.19. Retrieved from http://www.qualitative-research.net/index.php/fqs/article/view/2655/4079

Hazari, Z., Cass, C., & Beattie, C. (2015). Obscuring power structures in the physics classroom: Linking teacher positioning, student engagement, and physics identity development. *Journal of Research in Science Teaching*, *52*(6), 735-762. doi:10.1002/tea.21214

Hodkinson, P., & Hodkinson, H. (2001, December). *The strengths and limitations of case study research.* Paper presented to the Learning and Skills Development Agency conference, Cambridge, UK.

Hoeg, D.G. (2016). *Constitutions of nature by teacher practice and discourse in Ontario Grade 9 and 10 academic science* (Doctoral dissertation, University of Toronto, Toronto, Canada).

Holland, D., Lachicotte Jr., W., Skinner, D., & Cain, C. (1998). *Identity and agency in cultural worlds*. Cambridge, MA: Harvard University Press.

Holland, D., Lachicotte, W., & Skinner, D. (2001). *Identity and agency in cultural worlds.* Cambridge, MA: Harvard University Press.

Irwin, B., & Hramiak, A. (2010). A discourse analysis of trainee teacher identity in online discussion forums. *Technology, Pedagogy and Education, 19*(3), 361-377.

Jickling, B. (2016). Wild Pedagogies: A floating colloquium. *Pathways: the Ontario journal of outdoor education, 28*(4), 4-7.

Jordet, A. (2008, January). *Outdoor schooling in Norway—Research and experiences*. Paper presented at Nordisk-Baltisk Konference om Udeskole, Copenhagen, Denmark.

Jorgensen, M., & Phillips, L.J. (2002). *Discourse analysis: As theory and method*. London, UK: Sage Publications.

Kenney, J. L., Militana, H. P., & Donohue, M. H. (2003). Helping teachers to use their school's backyard as an outdoor classroom: A report on the watershed learning center program. *The Journal of Environmental Education, 35*(1), 18-26.

Lakehead University. (2009). Department of Undergraduate Studies in Education Courses. Retrieved from Lakehead University, Lakehead Calendar 2010-2011 website: http://mycoursecalendar.lakeheadu.ca/pg149.html

Langenbach, M., Vaughn, C., & Aagaard, L. (1994). *An introduction to educational research*. Needham Heights, MA: Allyn and Bacon.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.

Lemke, J. L. (2001). Articulating communities: Sociocultural perspectives on science education. *Journal of Research in Science Teaching, 38*(3), 296-316.

Lewis, L.H., & Williams, C.J. (1994). Experiential learning: Past and present. *New Directions for Adult and Continuing Education, 62*, 5-16.

Lincoln, Y.S. & Guba, E.G. (1984). *Naturalistic inquiry*. Newbury Park, CA: Sage Publications Inc.

Luehmann, A.L., & Markowitz, D. (2007). Science teachers' perceived benefits of an out-of-school enrichment programme: Identity needs and university affordances. *International Journal of Science Education, 29*(9), 1133-1161. doi:10.1080/09500690600944429

Martin, J.R. (2003). Cohesion and texture. In D. Schiffrin, D. Tannen, & H.E. Hamilton (Eds.), *The handbook of discourse analysis* (pp.35-54). Retrieved from http://www.blackwellreference.com.login.ezproxy.library.ualberta.ca/subscriber/tocnode?id=g9780631205968_chunk_g97806312059688 (Original work published 2001)

Merriam, S.B. (1998). *Qualitative research and case study applications in education* (Rev. ed.). San Francisco, CA: Jossey-Bass.

Mirka, G. (1973). Factors which influence elementary teachers' use of outdoor classrooms. *The Journal of Environmental Education, (4)*4, 31-33, doi: 10.1080/00958964.1973.10801768

Morag, O., Tal, T., & Keren, T. R. (2013). Long-term educational programs in nature parks: Characteristics, outcomes and challenges. *International Journal of Environmental and Science Education, 8*, 427-449. doi: 10.12973/ijese.2013.213a

Munby, H. (1986). Metaphor in the thinking of teachers: An exploratory study. *Journal of Curriculum Studies, 18*(2), 197-209.

Myers, M. D., & Newman, M. (2007). The qualitative interview in IS research: Examining the craft. *Information and Organization, 17*(1), 2-26.

Nedovic, S., & Morrissey, A. M. (2013). Calm active and focused: Children's responses to an organic outdoor learning environment. *Learning environments research, 16*(2), 281-295.

New London Group. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review, 66*, 60-92.

Norðdahl, K., & Jóhannesson, I. Á. (2015). Children's Outdoor Environment in Icelandic Educational Policy. *Scandinavian Journal of Educational Research, 59*(1), 1-23.

Norrick, N.R. (2003). Discourse and semantics. In D. Schiffrin, D. Tannen, & H.E. Hamilton (Eds.), *The handbook of discourse analysis* (pp.76-99). Retrieved from http://www.blackwellreference.com.login.ezproxy.library.ualberta.ca/subscriber/tocnode?id=g9780631205968_chunk_g97806312059685 (Original work published 2001).

Orion, N., Hofstein, A., Tamir, P., & Giddings, G. J. (1997). Development and validation of an instrument for assessing the learning environment of outdoor science activities. *Science Education, 81*(2), 161-171

Pedretti, E. G., Bencze, L., Hewitt, J., Romkey, L., & Jivraj, A. (2008). Promoting issues-based STSE perspectives in science teacher education: Problems of identity and ideology. *Science & Education*, *17*(8-9), 941-960.

Powers, A. L. (2004). Teacher preparation for environmental education: Faculty perspectives on the infusion of environmental education into preservice methods courses. *The Journal of Environmental Education, 35*(3), 3-11.

Priest, S. (1986). Redefining outdoor education: A matter of many relationships. The Journal of Environmental Education, 17(3), 13-15.

Queen's University. (2009). Outdoor and experiential education. Retrieved August 2, 2009, from http://educ.queensu.ca/oee.html.

Ragin, C.C. & Becker, H.S. (Eds.). (1992). *What is a case?* Cambridge, UK: Cambridge University Press.

274

Rahm, J., & Moore, J. C. (2015). A case study of long-term engagement and identity-in-practice: Insights into the STEM pathways of four underrepresented youths. *Journal of Research in Science Teaching, 53*(5), 768-801. doi: 10.1002/tea.21268

Reiss, M. (2005). Learning science outside the classroom: bringing it all together. *Science Teacher Education, 42*, 7-7.

Rickinson, M., Dillon, J., Teamey, K., Morris, M., Choi, M.Y., Sanders, D.,& Benefield, P. (2004). A review of research on outdoor learning. Shrewsbury, UK: *National Foundation for Educational Research and King's College London.*

Rogers, R. (2011). Becoming discourse analysts: Constructing meanings and identities. *Critical Inquiry in Language Studies, 8*(1), 72-104.

Sachs, J. (2001). Teacher professional identity: competing discourses, competing outcomes: *Journal of Education Policy*, 16(2), 149-161. doi:10.1080/02680930116819

Sarv, M., & Vilbaste, K. (2008, January). *Outdoor education in Estoni*. Paper presented at Nordisk-Baltisk Konference om Udeskole, Copenhagen, Denmark.

Savin-Baden, M., & Major, C. H. (2013). *Qualitative research: The essential guide to theory and practice*. London, UK: Routledge, p.75.

Schiffrin, D. (2003). Discourse markers: Language, meaning, and context. In D. Schiffrin, D. Tannen, & H.E. Hamilton (Eds.), *The handbook of discourse analysis* (pp.54-75). Retrieved from http://www.blackwellreference.com.login.ezproxy.library.ualberta.ca/subscriber/tocnode?id=g9780631205968_chunk_g97806312059684 (Original work published 2001)

Schneider, R. (2007). Science teacher educators as a community of practice. *Journal of Science Teacher Education, 18*, 693-697.

Şener, N., Türk, C., & Taş, E. (2015). Improving science attitude and creative thinking through science education project: A design, implementation and assessment. *Journal of Education and Training Studies, 3*(4), 57-67.

Sharp, L. B. (1943, May). Outside the classroom. In The Educational Forum (Vol. 7, No. 4, pp. 361-368). Taylor & Francis Group.

Simms, W. (2017). *Bringing environmental identity research into the classroom context* (Doctoral dissertation, University of Calgary, Calgary, Canada).

Sobel, D. (2004). Place-based education: Connecting classrooms and communities. Great Barrington, MA: The Orion Society.

Stake, R.E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage Publications, Inc.

Stake, R.E. (2006). *Multiple Case Study Analysis*. New York: The Guilford Press.

Suen, L. J., Huang, H. M., & Lee, H. H. (2014). A comparison of convenience sampling and purposive sampling. *Hu li za zhi The journal of nursing*, *61*(3), 105.

Szczepanski, A. (2001). What is outdoor education. In *EOE (European Institute for Outdoor Adventure Education and Experiential Learning) Other Ways of Learning: Outdoor Adventure Education and Experiential Learning in School and Youth Work*. Fourth European Congress for Outdoor Adventure Education and Experiential Learning. Marburg: EOE (pp. 17-24)

Taylor, C. (1994). The politics of recognition. In C. Taylor, K.A. Appiah, S.C. Rockefeller, M. Walzer, & S. Wolf (Eds.), *Multiculturalism: Examining the politics of recognition* (pp.25-73). Princeton, NJ: Princeton University Press.

Tannen, D. (1989). *Talking voices: Repetition, dialogue, and imagery in conversational discourse.* Cambridge, UK: Cambridge University Press.

Ting, K. L., & Siew, N. M. (2014). Effects of outdoor school ground lessons on students' science process skills and scientific curiosity. *Journal of Education and Learning, 3*(4), 96.

Tobin, K., Tippins, D.J., & Gallard, A.J. (1994). Research on instructional strategies for teaching science. In D.L. Gabel (Ed.), *Handbook of research on science teaching and learning: A project of the National Science Teachers Association* (pp.45-93). New York, NY: Macmillan Publishing Company.

Trauth-Nare, A. (2015). Influence of an intensive, field-based life science course on preservice teachers' self-efficacy for environmental science teaching. *Journal of Science Teacher Education, 26*(5), 497-519.

Turner III, D. W. (2010). Qualitative interview design: A practical guide for novice investigators. *The Qualitative Report, 15*(3), 754.

Uitto, A., Juuti, K., Lavonen, J., & Meisalo, V. (2006). Students' interest in biology and their out-of-school experiences. *Journal of Biological Education, 40*(3), 124-129.

University of Regina. (2016). 2016-2017 Undergraduate calendar. Retrieved from University of Regina website: http://www.uregina.ca/student/registrar/publications/undergraduate-calendar/current.html

Urrieta, L. (2007). Figured worlds and education: An introduction to the special issue. *The Urban Review, 39*(2), 107-116.

van Driel, J.H., Beijaard, D., & Verloop, N. (2001). Professional development and reform in science education: The role of teachers' practical knowledge. *Journal of Research in Science Teaching, 38*(2), 137-158.

Wallace, C. S., & Kang, N. H. (2004). An investigation of experienced secondary science teachers' beliefs about inquiry: An examination of competing belief sets. *Journal of Research in Science Teaching*, *41*(9), 936-960.

Welz, Laurenti, McMillan, Morden & Van Buskirk (2016)

Woodhouse, J.L., & Knapp, C.E. (2000). Place-based curriculum and instruction: Outdoor and environmental education approaches. Retrieved April 5, 2009, from Eric Digests: http://www.ericdigests.org/2001-3/place.htm.

Worster, A. M., & Abrams, E. (2005). Sense of place among New England commercial fishermen and organic farmers: Implications for socially constructed environmental education. *Environmental Education Research, 11*(5), 525-535. doi:10.1090/13504620500769676.

Yin, R. K. (2013). *Case study research: Design and methods (5th ed.)*. Los Angeles, CA: Sage publications.

QUESTIONNAIRE

Study Title: Biology teachers' identities who use the outdoors in their teaching: Using discourse as a lens

Principal Investigator:	**Supervisor:**
Julieta de los Santos	Dr. Susan Barker
[Contact information]	[Contact information]

Please answer the following questions by circling the best response or writing your answer where appropriate.

1.	Are you currently teaching Biology 20 and/or 30?	Yes	No
2.	How many years had you been teaching Biology 20 and/or 30?	Less than 3 yrs	More than 3 yrs
3.	Do you teach at a publicly funded high school?	Yes	No
4a.	Do you use the outdoors when teaching Biology 20 and/or 30?	Yes	No

4b. If YES to 4a, approximately how many times during Biology 20 and/or 30 do you bring students outside?

4c. If YES to 4a, please provide a few examples of your use of the outdoors and why you chose these activities.

Please **sign and date** below.

(Date)	**(Signature of Participant)**

(Date)	**(Signature of Investigator)**

If you are willing to participate in an interview, please provide your contact information.

If you have any questions now or in the future, please contact Julieta de los Santos (information above). The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, or if you have concerns about this study, you may contact the Research Ethics Office at (XXX) XXX-XXXX. This office has no direct involvement with this project.

APPENDIX B

SUMMARY: DISCOURSE AND GRAMMATICAL TOOLS

TOOL	DESCRIPTION
Micro Tool: Deixis	Deictics were used as a relation to context, and to see what assumptions the speaker makes on behalf of the listener and/or what the speaker expects the listener to be able to figure out. The Deixis grammatical tool provided relation of the participants' responses to context.
Micro Tool: Cohesion	The Cohesion Tool aided in understanding how ideas are linked to one another. By examining how the participants link their ideas, this helped in comprehending their statements. Greater understanding of participants' statements contributed towards analysis from the other discourse tools.
Micro Tool: Topic Flow or Topic Chaining	The Topic Flow or Topic Chaining Tool clarified the way that topics are related to one another based on the language structure. This tool helped clarify data in order to support analysis from The Connections Building Tool and Social Languages Tool.
Micro Tool: The Fill-In Tool	The Fill-In Tool revealed intention and further insight towards context and was chosen to provide further insight of the participants' responses, i.e. intention, purpose, meaning, context. Greater understanding of the context surrounding participants' responses was complementary towards other tools.
The Significance Building Tool	The Significance Building Tool helped discern what was discursively significant in language through positioning and/or wording. This tool helped show what was being emphasized through language even if it was not directly stated.
The Activities-Identities Building Tool	The Activities Building Tool was useful in describing specific aspects of teaching practice. When combined with The Identities Building Tool, they illustrated what kind of teacher would use these kinds of activities. The Activities and Identities Tool are linked with one another since an activity is recognized as representing the practice of a particular group, that is, a group with a particular identity who is recognized by partaking in specific activities.

The Connections Building Tool	The Connections Building Tool helped show the way teachers related descriptions of their teaching practice to the way they explained their incorporation of the outdoors. This tool clarified the relationship between their teaching and use of outdoor settings.
Social Language Tool and Doing, Not Just Saying Tool, and Situated Meaning Tool	The Social Languages Tool helped identify characteristics of the language of biology teachers who incorporate the outdoors. When combined with the Doing, Not Just Saying Tool, this helped describe the purpose of the social language. The Situated Meaning Tool helped clarify vocabulary within the social language. Since The Social Languages Tool helps identify a social language, its combination with The Doing, Not Just Saying Tool helped determine whether the actions of the language matched what the language was communicating. The Situated Meaning Tool further refined results from The Social Languages Tool by clarifying of certain vocabulary within context.
The Figured Worlds Tool	The Figured Worlds Tool helped identify what the teachers considered to be typical in their teaching practice. By describing what was usual in their teaching, this helped explain the participants' view of teaching, and what teaching is to them.
The Big "D" Discourse Tool	The Big "D" Discourse Tool was chosen as part of the analysis of biology teachers' identities who use the outdoors because it can help explore the way of being a kind of teacher, and was used as a framework for the cross-case analysis to elucidate common coherences among the participants.

APPENDIX C

EXAMPLES CITED

Example 1
1.   I switch every year, what I do.
2.   Not all the time, like I keep the things that work but, I don't care but, like, I'll try a bunch of new things, I'll take things out if I don't like it.
3.   I don't mind putting in the work, I guess, year to year?
4.   To change it so that it's not, like I mean, if something's not working why would I do it again?
5.   But I know people who do.
6.   Well partially, I don't wanna be bored but, more that like I don't think just because something works doesn't mean that there's not something better, I guess.
7.   So, why wouldn't you try something else that might work better?

Example 2
1.   They were *all* great because they can use them as examples.
2.   So it helps them to remember things they wouldn't, they wouldn't have just by reading.
3.   So they can translate this activity to this concept.

Example 3
(Researcher asked Zatanna what changes she had noticed from students after using labs, ex. better test scores.)
1.   Definitely in the um, the ecosystems unit and their biosphere unit but less so in the human biology because there's not as many hands-on labs that you can do.
2.   Or the labs that you are doing are not necessarily, I mean they may be models for something but they're not mimicking a real life situation, whereas the other ones do.
3.   So that I think if the lab can mimic as much as possible a real life scenario, that, is where I saw improvement.

Example 4
1.   So we did labs almost every day.
2.   Like a crazy number of labs and then they had, like they had movie Fridays.
3.   I mean, we had to, cuz it was just like they just couldn't go five days, it was just too much.
4.   So any 5 day week they had movie Friday that they could pick any movie they wanted as long as they could convince me that there was a science concept in the video.
5.   But it was, I mean, they were picking like, so we watched Jurassic Park because that could be genetics.
6.   And we watched Fast and the Furious because that's energy transfer and safety because in the, in the Grade 11 class they have um, transportation safety.
7.   So then we talked about why they were bad in Fast and the Furious for not wearing seatbelts and just things like that.

8. So I mean, as long as they were like, you have something every day, they were ok.
9. I did even more labs.
10. Cuz I do labs with them *all the time*, like all the time..
11. And so I think that hands on thing transferred into my other classes, not that, I was doing quite a bit of labs anyways, but then, even more.

Example 5
1. I don't have any.
2. That's what I say. [Laughs]
3. Like on my course outline, they have the rules, 1. respect, that's exactly, that's all it says.
4. And then I say, you know, I just explain to them, it's like, if I, I'll tell you what I do and then you have to mimic that because that's just appropriate behaviour, so if I drink a coffee, I'm gonna make sure I throw it in the garbage, if I'm gonna eat something, there's no crumbs.

Example 6
1. I think the best thing that I do is that I never [sighs] I don't know how to explain this but, I never expect something different from the students than I would expect of myself.
2. So in both, like I would *never* do something that I don't let my students do in class, ever...
3. For me, it's something simple like, I like to have an apple every morning at 10.
4. So I let the students eat in my classroom.
5. So whyyyy, if I can eat there, why can't they, if they're putting their garbage away like I put my garbage away?
6. So it's kind of like two sides of the coin, right?
7. So I'm allowed to eat, which is a privilege, so are they, which is a privilege, but I always throw my garbage away.
8. And so, they have to throw their garbage away to have the privilege.
9. So it's kind of, that and they, they get that, right?
10. Like, kids aren't stupid, right?
11. And I, I don't know.
12. I think they, what, makes it ok for them to come in and for them to be able to ask anything is the fact that they knooow, that I'm not gonna make fun of them because, or think anything less of them or, because if I do the same thing, I would want them to respond in the same way?
13. So I think that they get the mutuality, of the relationship?
14. Versus, 'I'm the teacher, you're the student'.
15. So, I think in that sense they're comfortable knowing that I'm not making up these crazy rules for some crazy say for that I think that, 'You're students so you can't eat in the classroom' or 'You can't have a coffee'.
16. It's like, 'I'm drinking a coffee, of course you can', like why especially because they're in high school, like they're high school students.
17. They're going to be adults, some of them are adults, some of them are 19, like whyyyy would I dictate what they can do and not do in that respect and so, I don't know, I think there's a mutual respect that I think makes them feel comfortable saying and doing things and coming

into class, and you know, they're not worried about the fact that they're hungry because they can just eat and then deal with the biology, right?

18. Like that's not, thinking about those kinds of stupid things to me, those administrative pieces of somebody, like, as a person isn't there, right?

19. So they can just sort of focus on the biology because they don't have to worry about, those other things.

Example 7
1. In Bio 20 you have to [incorporate the outdoors].
2. There's a field study component so, according to the Program of Studies you're supposed to.
3. So everybody, every single teacher in Bio 20 should be going outside but that is not always the case, I know that's true.
4. But when I first started teaching, I was teaching at a rural school and I was the only one there.
5. And so I'm like checking off the Program of Studies boxes, right?
6. So I'm like, "aw, field study, this sucks, I gotta go outside" and I didn't time it very well.
7. And so, it was winter and so I was like, "aw man, what am I gonna do?"
8. So the old principal who had seen me in my student teaching and had gotten me the job there, he was a total outdoors guy.
9. So he came in, volunteered, as a parent volunteer which has no kids but, whatever.
10. And drove a bus, so he rented a bus for us for free, so that was good.
11. And took us outside and so we kind of came up with the plan ourselves but we went on a winter field study.
12. And we actually went on the ice with the bus, which I'd never do now but, ya like at the time, right?
13. You're sort of like, "well, he knows what he's doing," right?
14. And so, we went out onto the ice, we drilled holes, we took water samples, they did ecosystem field study, I guess.
15. Throughout the whole thing we went to 3 different lakes that were in the area and did a comparison study as part of their field study.
16. And so after that, I think I was like, "aw, winter field study is so cool."
17. And so that's what I do with my Bio 20s as much as possible as a winter field study.
18. Going out that first time, I think motivated me to keep wanting to go outside cuz the kids love going outside, much more so than sitting in a classroom.
19. And it's biology so you think, "if you're gonna teach about the outdoors, you might as well be outdoors."

Example 8
1. It was so positive, like so positive.
2. I always go outside.
3. The kids hate it, so they say.
4. But then they don't, right?
5. They actually have fun.
6. We've been out in blizzards, it was literally a blizzard, the buses weren't running but this was our field study so they all came.
7. We were like, outside, it was so cold, so horrible, like so we thought.
8. But it was actually a ton of fun for the kids, they really liked it.

9. And if you talk to [name of a leading national textbook author and curriculum consultant] at all, he's very much a proponent of winter as like an outdoor learning place for biology.
10. So we've had lots of conversations about that, too.
11. That's my preferential time to go.
12. Winter specifically.
13. I prefer winter.
14. I think the kids don't go outside for winter and if they do, it's for sport and not, they don't necessarily understand that things are still happening in the winter. Right?
15. Like, they have this idea that winter means everything is sleeping or dead, right?
16. It's not.
17. So it's a good place for them to go and actually see like, "oh hey, guess what? Things still have to live out there. Weird."

Example 9
1. Well, it depends. If you go off school property it's a pain.
2. There's all this paperwork that you have to do to get them off property and then you have to have a certain student to teacher ratio and I mean, it's a nightmare.
3. Which is why I typically don't go off school property because it's way too much work and then you have to get permission forms and you have to get money if you're taking a bus and you have to do this, I mean, it's just like so much.
4. So much work.
5. So we luckily have a place that I can go that's not off school campus.
6. But even then, it's like you have to plan for what happens if the kids don't bring appropriate footwear, what happens if they don't bring appropriate clothing, what happens if they don't do their pre-lab stuff, can you leave them in the classroom and then you guys go outside, if you're doing like what I do, which is, I do have the lab open.
7. You have to make sure there's another adult there to watch them.
8. I mean it's, and they're, they're not in a confined space either.
9. So you don't necessarily see them.
10. I mean cuz they could be, there's lots of places they could be in the area that I don't see.
11. So you have to make sure that you trust your students.

Example 10
[Zatanna's response to providing examples of positive results she has seen from students after incorporating outdoor activities. She mentions that she has been incorporating a field study for both terms of a school year over the past seven years.]
1. They dress better for the weather, I noticed.
2. So I like that, you know, when they have to be outside for longer.
3. But, I think for me, I think, I don't know, if we went out in the summer I think it would be the same.
4. But, I think you develop a better relationship with the kids because now you've done something that they don't do elsewhere in school.
5. Like it's a separate sort of fun thing to do.
6. It's like field trip, right?
7. A mini field trip.
8. And then the kids, at least at the time, I think, feel more connected to what's happening around them in terms of nature.

9. They get really excited about any animals that they find.
10. So like, I think this last time that we went out, there was, it was like an ant and something else.
11. And the kids were like shocked that they could see these things that were moving on the trees.
12. They just couldn't believe it.
13. And they were watching them, they would follow them, like going up the tree, and then they started fighting, and then one ate the other.
14. I don't know exactly what, I can't remember the whole scenario but, they were fascinated by it.
15. They were recording it, they used it as part of their field study project, they incorporated pictures from it and they were just like beyond fascinated by this thing, right?
16. And I think that that's the important part cuz it's like me saying, "This bug eats this bug."
17. Nobody's fascinated by that, right?
18. And so, they do get fascinated by that stuff and I like that.
19. I like watching them turn into little kids cuz they're so worried about being cool in high school.

Example 11
1. Biology 20 – we did an investigation related to classification where students collected or took pictures of samples that were then classified using Gitxsan classification and Biological classification – this was used as prep for a field study and knowledge about different classification systems,
2. Biology 20 – field study was performed which had students analyze how abiotic and biotic factors influenced each other in an ecosystem,
3. Biology 30 – walk through a forest – this was done to show an intermediate stage of succession and why this was an intermediate phase

Example 12
[Researcher asks Zatanna to describe her view of teaching.]
1. I guess helping my students be the best, cliche as it sounds, the best they can be or want to be in certain things.
2. Especially cuz I teach high school, right?
3. Cuz like lots of them don't like science.
4. That's ok.
5. I would never, like, I guess most of them are at a point where, if they've hated it for this long, let's try and make sure that you have a pleasant experience this last time through and then go do your fill in the blank, whatever you actually care about.
6. So I don't think...yeah, I guess it's more important, to like focus on the student themselves and not so much the subject matter you're teaching?

Example 13
1. I don't think anything else is important in my teaching.
2. I mean cuz, and I guess as I'm going through, in the end, the kids that are going to university do well despite you.

3. And so, the subject matter, I mean, the thing is, like I know my subject matter and I don't ever worry about that, like that's not something I worry about.
4. I know I can teach this subject matter and I know that the high academic kids learn from me and they like it, blah, blah, blah.
5. So I don't have to worry about that.
6. I just don't feel like it's important because it's just something that happens.
7. This and other things cuz you're like training these little people to be adults.
8. Well, like those things about respect and those kinds of things.
9. Those are more important to me than the subject material.

Example 14
1. Um, maybe one of the most important things, as a teacher, um, I'd, I'd say there's probably two words that pop into my head right away.
2. And number one, is trust.
3. That, students trust you, that you trust students, that you trust the people you work with and work for, right?
4. And then that relationship is sound.
5. Once that relationship is sound, then learning is gonna happen, you know.
6. It's almost like you can't prevent it from happening.
7. So that, that relationship and trust, and all that stuff that goes with it is *really* important to me.
8. And trust goes with you know, um, always saying what you're gonna do and do what you're gonna say, right?
9. So I mean, you, you have to be...trustworthy. Right?
10. Um...and the other thing is probably, you know that trust and relationships are really closely so I'd put that kind of together right?
11. Trust and relationships.
12. Because once you develop that trust and those relationships, everything else just kind of flows. Right?
13. It doesn't even, whether it's education or not, or whatever, it just works. Right?
14. Um...and the other thing is probably, probably related, it's kind of, kind of like a, there's two words and they're kind of ringing around in my head, and they're authenticity and integrity. Right?
15. That, that, that's what you are and that's what you show to students, and that's what you would like those students to be when they go out into the world.
16. Like I don't really care if they know the Heisenberg Uncertainty Principle.
17. And I don't really care if they know how to do water tests.
18. What I want them to be is good people, right?
19. To know that they can *trust* people.
20. Like teachers, to know um, that the whole kind of system is gonna hold together for them.
21. And that they can go and they can go out there and trust it to be there for them.

22. So when they go to get a job, they'll want to follow those rules and be part of society and you know, just kind of be good people too, be good people back, right?

Example 15
1. Uh, yes.
2. Not just the outdoors but environment, yes, very much so. Right.
3. Well because first of all, I feel like what the students have experienced in nature, once you have that appreciation for nature, then you're more likely to take care of it.
4. And these, these people that are coming through our schools, I think about *thousands* of students I've had come through my classrooms and if I can influence even 10% of those to go out and take better care of their world, then I've made a difference in this world. Right?
5. That those people will have some, anybody who goes out and goes to the mountains and goes hiking, has one of those experiences where it's just fantastic, can't go home and just throw their McDonald's container out the window. Right?
6. It's not consistent with their beliefs and so if you can have a belief system where the environment is important to you and you can convey that to your students, maybe somewhere down the line we'll take a little bit better care of it.
7. I think that is very important.
8. That is one of my core beliefs, right?

Example 16
1. Um, because you really have to have the confidence to present that.
2. And students like it when they feel confident in you. Right?
3. If they feel, and I've seen it happen with student teachers more times than I can count, if they lose confidence in you, if they think that you can't guide them through it, then you've lost them.
4. Those higher level students, um, the science 14, 24, they just wanna get through it and if you pass 'em on a test, they're happy, they don't care how much they learn.
5. But those upper level IB students that are headed into medicine or whatever they want to know that they are learning what they are supposed to be learning and they're learning it well and maybe even learning it more than they have to because they eventually feel like they're going to be held accountable for it.
6. And so they hold you very accountable.
7. So I think it's ok to learn with students in some contexts, absolutely.
8. But in situations where the accountability level is high, and students have to go on to very high level studies then people have to have the confidence to be able to teach at that level.
9. And to have the confidence, you have to have more knowledge than your students do.
10. And it's not necessarily knowledge in terms of facts, it's knowledge in terms of how that science works, right?
11. You have to be able to guide them through it.
12. If you can't write a balanced chemical equation, then you can't teach chemistry. Right?

13. So there's a certain amount that you can learn with your students.
14. But there's a certain amount that you just have to be able to do it and you have to be able to do it better than them.
15. And, even better, you have to be able to show them how to do it in the way they understand.
16. And to be able to show them in a way that they understand, you have to have some kind of depth of understanding yourself.

Example 17
1. Yeah, I think that's very much what I do.
2. I think you kinda nailed me there.
3. That's very much what I do.
4. Um, I like to do the same thing twice because I like to try it again but then after two or three times, then I'm tired of it and I wanna do something different.
5. You're absolutely right.
6. And so, yeah, very much, I like to change it up every time I do it.
7. Sometimes it changes itself, so when you do a self-designed field study every year, students are just changing it themselves, right?
8. They're different kids, they're doing different things you don't have to change the way you do things because it's gonna be different every time.
9. But some things, I like to change.
10. Um, and it's always something *different* that I'm changing.
11. Sometimes I'm doing more stuff on-line.
12. I tried that last year.
13. Sometimes I'm doing more stuff with equipment in the lab. Right?
14. Sometimes I'm doing things more with um, philosophical perspectives on things like the atom, right?
15. So there's always something different.
16. I'm kind of scattered in that I don't have one thing that I marshal, right?
17. I don't have one thing that I concentrate on.
18. I like to dabble in all kinds of things.
19. Makes life interesting.

Example 18
1. You know what it was?
2. It was the students.
3. Because the students were very keen and so when I was teaching certain subjects I felt that I didn't have enough knowledge to teach them as much as they were capable of learning.
4. And not just knowledge, just the, just my whole background was not sufficient to be able to, I didn't have enough depth to be able to really do it justice. Right?
5. So I wanted to go back and get background, depth, exposure.

Example 19

1. Well, there's a few things.
2. I think first of all, I don't think you can experience nature unless you're in it, you know.
3. Really, I guess I've had a lot of experience with nature in my life, right?
4. And I have had this feeling of, 'this is wonderful,' you know, 'this smells great, this looks great, this is, this is an inspiring experience,' right?
5. I guess I wanna pass that onto my students.
6. Um, and it's a real bonding experience with the class.
7. Especially when you do it in September when you're just starting out with a class.
8. I usually develop a relationship very quickly with those students.
9. And it's a different kind of relationship than you have when they're sitting in a desk.
10. So, like I told you last time we, this last time we went out, we all sat around and ate lunch together.
11. And you know we just talked about stuff and it's got nothing to do with ecology either, about, you, you know, what they did at their Grade 2 birthday party or something. Right?
12. Its got nothing to do with the, with what you're doing but it's that relationship.
13. They get to know you on a little different level and you get to sit on the grass with them and eat lunch and you know, they can make fun of you and stuff.
14. And that is really good.

Example 20

1. Yeah. Like I said, we, we, we tell students that they should plan on coming and going, just in case we decide to go.
2. If it's miserable out we don't go and we tell students to dress for the weather so they all come with their, well not all of them, but some of them come with rain boots and their, and their rain jackets and stuff, just in case.
3. But we always cancel if the weather is really rotten.
4. Just because students do not have a positive experience you know so yeah, then you have to re-plan it all, you have to re-book it, the bus, and you have to re-book the place, and to, you know, sometimes you even have to re-do the forms.
5. But I have gotten smart on that and what I do, is I put 2 or 3 dates on my permission form so the parents only have to sign it once.
6. Then, if it rains, you just go on the next date, they've already signed the form. Right?
7. So I've got a really good bus driver that I've got a good relationship with and he allows me to cancel at the last minute and book at the last minute.
8. Yeah. So you develop those ties after a while.
9. So that you can do it.
10. It's not easy but you develop those strategies for dealing with that because you know it might happen.

Example 21
1. And, and most of the time, um, we've, we've changed our field study program now so that we have flexibility to go when the weather's nice.
2. Because it seems to be *very* important.
3. When you go on those freezing cold days, unless you have a real keen class like that IB class I had, that would go in any weather if you take a bunch of kids that kind of, don't wanna go in the first place, out into wet, snowy weather they're not going to like nature. [Laughs]
4. Unless it's nice out, right?
5. And so we, we make an effort to have several kind of rain-out days so that if it's not nice, we don't go anymore.

Example 22
1. Oh, it's *huuuuge*.
2. Yeah, it's huge.
3. I mean, we're still working on field studies.
4. Every year we tweak them a little bit more.
5. Because everywhere here, we say, 'ok, those kids didn't like that,' or 'this was dumb and they didn't learn anything,' or 'we won't do that again because such and such a thing happened.'
6. You know, every year we tweak them and I've been doing this for a long time and we still haven't found the perfect field study.
7. But, but, absolutely, not just student enjoyment but student ability to do it.
8. Because it's surprising how lost they get so quickly, like you give them a little instruction sheet and it seems very straightforward to you, "Put a drop of this in there, a drop of that, then mix them together and then look at this thing," right?
9. And you think it's very straightforward.
10. But when they try to do it out in the bush all by themselves, they get all confused.
11. And you can't be at 6 places all at the same time.
12. You can only run so fast through those bushes, right?
13. So, so you'll come upon them 3/4 an hour later, and they're sitting there and they don't know what to do, and they've been sitting there for 3/4 of an hour, right?
14. So you have, so it's important that they know what to do.
15. Otherwise they just feel lost and they don't like it and they don't feel like they're getting anything done.

Example 23

1. And that's why we really started doing student-designed, part of the reason why we started doing student-designed labs because they take off with it then.
2. It's their lab, they know what they're doing cuz they designed it.
3. And then they kind of take off with that.
4. But with that said, you have to make sure that you cover things.

5. So we'll have a section on water testing, they have to do some kind of water testing, they figure out what they're gonna do. Right?
6. And they have a section on survey so they do some kind of survey, and we have another section on, kind of, there's a range of things they can do that covers the program of studies, right?
7. So they, so they have to do at least 3 things, which takes them quite a bit of time.
8. They're their 3 things.
9. Like I talked about last time the, with the group that did the pictures of the wildflowers.
10. I mean, they were *beautiful* and this was the end of the season when there are hardly any flowers left.
11. You know, they did get lost in the bush for quite a period of time [laughs].
12. But they came back with these pictures.
13. And it was really well done and those are 2 of my weakest students.

Example 24
(Shiera was asked why she decided to use a field study as an activity.)
1. Um, well, the field study is required curriculum.
2. Well, we make a bigger deal out of it than most.

Example 25
(Shiera was asked to explain the way in which she makes the field study a big deal.)
1. I mean we make it a major part of the course.
2. We spend a lot of time on it.
3. We always go out to a natural area, we don't just go to our own parking lot or whatever.
4. And, and we make students plan their own investigations.
5. So that takes a considerable amount of time and work. Right?
6. And we spend anywhere from half a day to a full day on the field study depending on the weather, the students, and how course schedules work.

Example 26
(Shiera describes her most recent field study.)
1. Yeah. The last time we went was last semester and we do it right at the beginning of the year before we even know our students because of the weather, right?
2. So we start in September and we go right as soon as we can.
3. And we went to a place called "Strathcona Wilderness Center" because they have a really nice pond out there that has an outhouse close by, it has a nice clean trails there so students can get access to the forest, and it has a boat that you can actually put a little dhingy boat into and a lot of ponds you can't walk up easily to because you have a lot of muskeg in between and you get really stuck, and this one's good.
4. So we went there and we spent, uh well the morning and the noon hour so from 9am til 1230 out there.
5. And the students designed their own investigations.

6. They had to design one investigation that involved population counting exercise.
7. One investigation that involved water testing or soil testing, either one, some kind of chemical testing.
8. And one part that was a survey, surveying plants or bugs.
9. It was a three part.
10. So they designed each of the three parts in groups.
11. Well, we had beautiful weather, the kids were really great, I kind of got to know them that day.
12. We had a lot of crazy characters and so we had a lot of fun.

Example 27
(Shiera explains characteristics of student behavior that represented their interest while learning outside.)
1. You know what, I don't know if their grades were better and I don't know if their questions were more in-depth but what they did, they had personal interest in. Right?
2. So if they liked flowers, they did flowers.
3. So if they liked bugs, they did bugs.
4. If they wanted to go sail in the boat, they sailed in the boat.
5. And so I think for the most part they enjoyed it more.
6. I don't know if their marks were better because it's very difficult to plan your own study and do it and present something that makes sense right at the beginning of a course before you learn anything about science, really.
7. All they have is Science 10.
8. So they have a hard time doing it and in some cases I was disappointed with the results because they, they would just slap something together, slap it up there and say 'that's science' and it really wasn't, you know?
9. Cuz they didn't have any idea of the expectations.
10. So I, I would love to put it right at the middle of the course right when they know me, I don't have to wait right til the end but at least give it a month or so a month and a half so they can get to know me and what I expect from a self-planned investigation.
11. But in the case of Alberta, right?
12. If you don't go out in September then you don't really go out.
13. I mean, I've done winter ecology studies before but found that they were very difficult, the weather was unpredictable and the students didn't like being cold so I'll never do it again.
14. I did it once and I never did it again.

Example 28
1. Yes [laughs]. I'd say it's both.
2. It's very much a tool because it's something different that kids can enjoy because it's different and it's fun to go outside and do something different and, you know.
3. But it's also a part of my philosophy that you have to have a big picture when you're studying science.

4. And one of the biggest pictures is, nature is amazing, right?
5. And how can you know nature is amazing unless you go in nature? Right?
6. You can't know that unless you have some kind of experience with it.
7. So that's why the weather's gotta be nice too.
8. Because if it's not amazing, then it's just not, it's just not getting the right idea across.

Example 29
1. And in terms of outdoor education, I think that some of the best courses that I took in my science undergraduate were courses that went out to Banff field on the west coast and studied invertebrates.
2. You know when you're outdoors and you're doing that kind of stuff and I mean especially biology, biology doesn't only happen in a classroom, most of it's happening outside around us.
3. So that was certainly something that I wanted to incorporate into my teaching, I knew.

Example 30
1. In an ideal world?
2. I would love for them to have a deeper appreciation of science.
3. And to recognize that science is everywhere, all around us.
4. And I mean, my wife has a Ph.D. in literature and English and we see things so very differently.
5. Like, I just dropped them off at the art gallery, right?
6. And they have this Piet Mondrian painting there, which I love Mondrian.
7. And we were talking about the intersecting lines that are on this painting, and how when you look at them, your rods and cones get confused and they see little dots in the intersecting lines that aren't really there.
8. So like, I see that science stuff everywhere, even in art.
9. If you could get students to start finding their own connections between science and their everyday lives, then that to me is the ultimate goal.
10. Who cares about learning the parts of the heart?
11. Like I'll teach them it.
12. I'll teach it to them in a fun way.
13. But they can look that up too.
14. But if they're actually excited about it then that's even a better goal.

Example 31
1. Yeah, for that course [Science 20], one of the things that I always do is uh for natural selection, I, I'll show you a picture.
2. Um, I give them, I tell them they're predators and they're outside and they're gonna look for prey.
3. And the prey that I give them is coloured toothpicks.

4. And what they do with it is, I have a timer, they go out onto the lawn wherever here and they have to collect as many prey as possible and so the coloured toothpicks—there's green, blue, yellow and red, right?
5. When you buy the bottle of it.
6. So, like those kind of toothpicks.
7. So I sprinkle them outside here and I count them out first and I have them go, and they collect as many as they can and then they, we come back in and we count them.
8. And then we talk about well, why is it that we almost found all the yellow and red ones but we found very few of the green ones and a couple of the blue ones, right?
9. So that whole idea of, you know, blending in to your surroundings.
10. So that would be like a quick thing where we'd go outside to do something like that.
11. Or, what I've done for their succession, again, harder in this community, for secondary succession I had them do a photo scavenger hunt.

Example 32
1. Yeah, like [name of former school] was in an industrial area and it's an older school and like older buildings around, right?
2. So, any evidence of secondary succession then would be where you've got plants growing through cracks in the ground or maybe you've got some moss growing on a wall, like that kind of stuff, you know?
3. Like, looking for where you'd start to see, and I start that out by saying like "let's imagine that humans stepped away from Edmonton for a hundred years, what would that look like?
4. Let's go outside and see some evidence of what that, cuz plants are always opportunistic and find a place where they can kind of start to grow.
5. Let's try and find a place where we can see some evidence of that starting to happen."
6. And they already know the answer of what things might look like or they have some idea anyways of what things may look like a hundred years from now if we abandon some place so I use that to sort of set the stage.
7. And then, I'm always surprised at the things that they can find.

Example 33
(Researcher asks Hal if the outdoors is the best way to show that science is everywhere.)
1. I think it's one way to showcase them.
2. Uh, one way that, another way that I try to showcase that connection is trying to read the paper every day, every morning, and from the courses that I teach, I can almost always pick out an article that's in the paper that day and relate it to something that we've studied in one of the courses.
3. So I usually try and bring that in to show the kids that like, 'Hey! we're talking about genes that maybe influence cardiovascular disease.
4. Here's a discovery that they made about that!'
5. Talking about this in class yesterday, here it is in the paper today'.

6. Like and that happens so often um, it's very serendipitous, it just, it seems to really work out, and partly 'cause I'm looking for it.
7. But partly 'cause it's the truth: that what we're studying does relate to the real world.
8. So that certainly is a connection, I mean, this kind of stuff and how, like, I teach about evolution in two of my classes.
9. In biology and in Science 20 and having these photos of students who are my students and showing them in the Galapagos next to a giant tortoise is way more meaningful, even if the kids haven't been there they are much more engaged and interested in it.
10. Especially when I was still at Wagner and I could say, 'Hey here's Daniel, last year who you, lots of you know on the Galapagos.
11. This is a real place.
12. Here's how cool it is.
13. Here's how it inspired Darwin, here's why.'
14. Oh, even when I showed them this year, to this class, talking different school, how many years ago and I show them photos of me in the Galapagos and the kids there it's way more meaningful to them and I think they are better able to engage with it and that they're better able to understand it.

Example 34
1. I mean, I think we were talking about this before, it would be awesome to go and do one of those sailboat, I wanna sail around the world and teach the global outdoor classroom.
2. And that's real learning.
3. Like I can't wait to take my son to Banff field to go like play in the tide pools and you know, touch starfish and that kinda stuff because that's where you really get excited about science.
4. You might have a fantastic teacher in elementary and, and be excited about the topic of science, but the outdoors is where science happens.

Example 35
1. Well, I think that often when we're teaching, I always say like it's not about what we're learning it's about learning how to learn.
2. Because it doesn't matter what's in the program of studies you know, you can pick and choose and replace different things and it's really about teaching students how to learn and I mean, some of them probably won't spend a lot of time outdoors but this is an opportunity to tell them a little bit more about the world outside of the classroom.
3. I mean, I guess I can talk about what I would like and what I actually do.
4. You know, I would love to be with students outside a lot more but I do feel constrained by the red tape, by the demanding programs of studies that we're expected to get through and just by the position of this school not being very accessible to a nice, natural area…
5. I would love to take students out more.
6. …Think the same thing happens with just any kind of hands-on practical lab skills stuff in science.

7. It's like, I know I should be doing more chemistry labs but it sure is a lot easier for me to stand up here and say, "Here's how to do this kind of equation.

8. Do some practice worksheets and we can move on."

9. Labs take more work to set up and there's an element of you're not in control, right?

10. Because now there's ten groups around the classroom who are all in control of their stuff.

11. And going outside is the same kind of thing, right?

12. Like when I go to Terwilliger Park with students we do like the field study and stuff but we also do gold panning which is not at all part of our program of studies other than we have a geology component so I can kind of loosely tie it in or whatever.

13. But, it's really amazing to them that they can get gold from the North Saskatchewan River.

14. Like, the average person here probably wouldn't know that.

15. Like, every time you put your pan in there you'll get some gold flakes not flakes, sorry, gold dust, powder, like you'll see it.

16. And yeah, you have to do it for like 10 minutes of swooshing and you get a few flecks of gold but, to those students that's pretty mind blowing.

17. Like, they think they're all rich instantly, that I've given them the secret to this but to think if you want an ounce of gold, you gotta be out there for a few months, right, or more.

Example 36
1. Well, I mean the fact that the students were taking a lot of pictures of things and sending them back to their friends who were at school who were not on the trip, just sort of, and to sort of brag about that.

2. And I think he went and purposefully asked them a lot of questions about what they had learned and what they liked about the museum, more like he wanted to check to see that they had gotten something out of it.

3. And, and for me I think like you could fill in all the blanks that you want on a piece of paper and not get anything out of that.

4. But, just the fact that they, they didn't want to leave, they all bought something at the souvenir shop that had some kind of dinosaur thing on it, like, and that student's comment to me about how he's wanted to travel, like that kind of stuff.

5. It's just, that's the anecdotal evidence that you get every time you take them out.

Example 37
(Hal was asked whether the outdoors are important to his teaching.)
1. Um, yeah, I mean, how can you teach biology especially, and talk about the world outside and not take kids out?

2. I mean, I'm from a rural, Northern Alberta background.

3. And what I find surprising in the city, I don't know if you can call them city kids if you've been living in the city for so long yourself but, is that we talk about food chains and food webs and they have no idea.

4. It's like, human cow grass, like that's their idea of a food chain.

5. If you don't take them outside, how are they ever gonna learn that kind of stuff?

6. I mean it's unfortunate as well that we have such a tight curriculum that it's hard to just say, "Hey, let's go on a nature walk" and I can tell you about, I can name all the plants and animals in this river valley and so let's go and do that, you know?

7. But like, especially in high school, that becomes hard because your content is so, the programs that we teach are so content heavy.

8. And yeah, they're about the outdoors and interaction but uh, it's, it's a lot easier to stand in front of the classroom and talk about that than to take them out.

9. But, it's important to do it.

APPENDIX D

ETHIFCS APPROVAL

Notification of Approval

Date: December 15, 2011

Study ID: Pro00021270

Principal Investigator: Julieta Delos Santos

Study Supervisor: Susan Barker

Study Title: The identities of biology teachers who use outdoors in their teaching: Using discourse as a lens

Approval Expiry Date: December 13, 2012

Approved Consent Form:	Approval Date 12/15/2011	Approved Document Letter of Information and Letter of Consent

Thank you for submitting the above study to the Research Ethics Board 1. Your application has been reviewed and approved on behalf of the committee.

A renewal report must be submitted next year prior to the expiry of this approval if your study still requires ethics approval. If you do not renew on or before the renewal expiry date, you will have to re-submit an ethics application.

Approval by the Research Ethics Board does not encompass authorization to access the staff, students, facilities or resources of local institutions for the purposes of the research.

Sincerely,

Dr. William Dunn
Chair, Research Ethics Board 1

Note: This correspondence includes an electronic signature (validation and approval via an online system)

APPENDIX E

ETHICS CLOSING REPORT

Julieta Delos Santos | My Home | Logoff
HOME
Human > The identities of biology teachers who use outdoors in their teaching: Using discourse as a lens
> The identities of biology teachers who use
outdoors in their teaching: Using discourse as a lens
<< Return to Workspace < Prev 1 / 1 Next >
Activity Details (Closing Report Submitted) Used by the study staff to submit a close report
Author: Julieta Delos Santos (Student)
Logged For (Closing Report): The identities of biology teachers who use outdoors in their teaching: Using
discourse as a lens
Activity Date: 29/10/2012 10:47
Activity Form Property Changes Documents Notifications
Submit this form to forward the study close report to the REB Administrator.
Comments:
All data had been collected. No further interaction with human subjects needed.
<< Return to Workspace

CONSENT FORM

CONSENT FORM FOR INTERVIEW PARTICIPANTS

Study Title: Biology teachers' identities who use the outdoors in their teaching: Using discourse as a lens

Principal Investigator:
Julieta de los Santos
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University of Alberta
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(780) 451-4260

Supervisor:
Dr. Susan Barker
Chair, Department of Secondary Education
University of Alberta
Edmonton, AB, T6G 2G5
Susan.barker@ualberta.ca
(780) 492-3674

I give my consent to be interviewed and/or to write of my experiences regarding this topic.

- I understand that my participation in all aspects of the study is voluntary.

- I have read the "Information Letter" and understand the purpose of the study.

- I understand that my participation is voluntary, and that I may withdraw from the study at any time until two weeks after receiving the transcribed interview, without having to give reasons, and without penalty of any sort.

- I understand my identity will be kept anonymous, and no data will be attributed to me in any way that will identify me.

- I understand that the questionnaire and interview data will be maintained in a secure location for a minimum of 5 years, and that the data will be held until all publication from the study is complete, then it will be destroyed.

- I acknowledge that the research procedures have been adequately described, and that any questions I have asked have been answered to my satisfaction. In addition, I know that I may contact the Principal Investigator, Julieta Delos Santos (julieta@ualberta.ca, phone: (780) 451-4260,), if I have further questions either now or in the future.

- I understand that the interview may be audio-recorded and/or the researcher will take written notes.

- Do you understand the benefits and risks involved in taking part in this research study?

- Do you understand who will have access to the data?

- Do you consent to having the data used for a graduate thesis, for presentations at academic conferences, and for academic journal publications?

I understand my rights as a participant and agree to take part in this study. YES ☐ NO ☐

Please **sign and date** below indicating your willingness to participate in an interview.

_____
(Date)

_____
(Signature of Participant)

(Date)   **(Signature of Investigator)**

If you would like to read a report of the results, please provide your e-mail address below. Your e-mail address will not be part of your interview data.

Name: _____

E-mail: _____

If you have any questions now or in the future, please contact Julieta de los Santos (information above). The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, or if you have concerns about this study, you may contact the Research Ethics Office at (780) 492-2615. This office has no direct involvement with this project.

LETTER OF INFORMATION

INFORMATION LETTER FOR POTENTIAL INTERVIEW PARTICIPANTS

Study Title: Biology teachers' identities who use the outdoors in their teaching: Using discourse as a lens

Research Investigator:	**Supervisor:**
Julieta de los Santos	Dr. Susan Barker
Department of Secondary Education	Chair, Department of Secondary Education
University of Alberta	University of Alberta
Edmonton, AB, T6G 2G5	Edmonton, AB, T6G 2G5
julieta@ualberta.ca	Susan.barker@ualberta.ca
(780) 451-4260	(780) 492-3674

Background
- Participation is voluntary. You are invited to participate in a research study which will explore the identities of biology teachers who use the outdoors in their teaching. The research is being done by Julieta de los Santos from the Department of Secondary Education, at the University of Alberta. Biology teachers who teach at publicly funded high schools are being invited to participate.
- Data are being collected for a graduate thesis.

Purpose
- The purpose of the research is to describe the identities of biology teachers who use the outdoors.
- It is hoped that results from this study will further explore the relationship between teacher identity and practice.

Study Procedures
- Participating in the study involves completing a questionnaire and a maximum of 2 interviews (one in January and one in February).
  - o The first interview will last about 20 minutes, and will take place in January.
  - o If you are invited to participate in the second interview, this will take place in February and will last about 1 hour.
  - o The interview will be audio-recorded, and transcribed. The transcription will be sent to you and you will have 2 weeks from the time it is sent, in order to make any edits. You may reply with any changes or indication that changes are not necessary, to Julieta de los Santos (information above).

Benefits
- As far as is known, a benefit to you is deeper reflection about your teaching practice.
- I hope that the information I get from doing this study will help me better understand the identities of biology teachers who use the outdoors.
- There is no cost, compensation, or reimbursement, for being involved in the research.

Risk
- As far as is known, there is no potential harm to you. If anything is found during the research which may affect your willingness to continue being in the study, you will be told immediately.
- The only inconvenience is your time.

Voluntary Participation
- You have the right not to participate in this study.

- You may withdraw at any time, until the time 2 weeks after you receive a copy of your transcribed interview, without any reasons and without any consequences for you. Your interview answers would be deleted from the study if you do withdraw. You may choose not to answer any particular questions.

Confidentiality & Anonymity
- The interviewer is bound by the University of Alberta Standards for the Protection of Human Research Participants. This means that we will protect your confidentiality, and your identity will remain anonymous.
- The answers to the interview questions will be handled in compliance with the Standards, and will be used for a dissertation, presented at academic conferences and published in academic journals.
- The Research Ethics Board may access the data.
- If you would like a summary of the research when it is finished, you may provide us with your contact information.
- If you participate in the study, study data including personal information about you, questionnaire and interview answers will be stored in a safe place for a minimum of 5 years (computer data will be password protected, and printed data will be locked in a cabinet in the researcher's office) at which time it will be destroyed.

Further Information
- If you have any questions now or in the future, or if you would like to participate, please contact Julieta de los Santos (information above).
- The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, or if you have concerns about this study, you may contact the Research Ethics Office at (780) 492-2615. This office has no direct involvement with this project.

INTERVIEW 2 QUESTIONS: ZATANNA

The following are the questions I had asked Zatanna, in order, during her final interview. (Notes: Filler words, ex. um, mhm, etc. were removed as they did not contribute towards the question asked.)

1. Q: So before you were teaching, science was your major?
2. Q: What made you study science?
3. Q: For...any reason or?
4. Q: So, you mentioned that in your first interview you had worked in a lab for a year and then you didn't like it and then you wanted to keep up with biology, staying in something related to biology and ultimately, that's what led you to teaching, right? So what was it about the lab that you didn't enjoy? 1
5. Q: What was it like for you?
6. Q: So, I was just kind of wondering like, when you said, 'Ok, the lab isn't for me but I still wanna do something related to biology,' like why not something else other than teaching? I'm just like, real curious.
7. Q: Anyways, so when you went into teaching, like why did you choose high school cuz you could choose elementary, you could choose middle school?
8. Q: Ok, what about junior high? They're not so little.
9. Q: Ok, so what's your qualification in, like how does it work...here?
10. Q: And so like you've only ever taught science-related courses, like you said first year, like you said first year, bio and chemistry?
11. Q: So it's both of them combined?
12. Q: Like you have to take anthro and world religion?
13. Q: Anyways, so when you got into teaching, right after coming from this lab environment and coming from a lot of science background, did that influence you in any way? Like, how you saw science teaching or your approach towards science teaching? Or even the lab activities that you did? Like I know that high school students wouldn't be doing like, the same kind of work you did in the lab but?
14. Q: Right, how did you find out? That they...
15. Q: Like one per unit or 2 or 3 per unit?
16. Q: Oh, one a week?
17. Q: I'm sorry, what's Science 14?
18. Q: What grade level is this?
19. Q: Grade 10, ok. And the regular grade 10 is Science 20?
20. Q: So is that like a whole different curriculum then?
21. Q: Ok, is that more emphasis on society, like application of science?

22. Q: Right. Ok. So, did you have any notions of...of what teaching is or how you would be as a teacher when you first went into B.Ed or were you just like, 'let's try it out and see what happens'?

23. Q: Is that really what stood out for you the most like during your B.Ed year or your B.Ed years, was that, 'Wow, working with students, this is really fun"?

24. Q: What was it about the students that you enjoyed so much?

25. Q: And so is it, did you find the same level of response between your student teaching, students, right? IPT, APT, and rural students?

26. Q: So was it just kind of an enthusiasm with science or, is it just they're willing to do whatever you wanted, like what, I'm, what I'm trying, what I'm trying to get at is, what do you mean by 'responded to you well'? I mean, cuz what I imagine may not be what you had experienced. So there's a sense of genuine effort?

27. Q: Right. Ok. Did you find, it's kind of...positive reinforcement, like, from the students. Did you find that very encouraging, like, 'ok, you know, I'm gonna keep doing activities, I'm gonna keep trying new stuff,' or, are you like, 'ok, let's just stick to what works and that's it'?

28. Q: Right. So is this your own personal interest, like you, yourself just don't want to be bored so like let's change it up each year or is there a different reason?

29. Q: Did you have any mentors or role models in teaching, was there anyone you really looked up to or anything like that?

30. Q: So this whole notion of um, um, changing activities from year to year, right? Where did that, where did that come from? Like, did you learn that from someone or is this something like you, you personally?

31. Q: What did he or she say?

32. Q: So in your, just to talk a little bit more about um, your own teaching and your own teaching style, um, last time I had asked you like, you know, what are some of your personal goals, right? For teaching. And you had mentioned, 'for students to be comfortable,' where they can come into your class and, and just be comfortable. What are the kinds of things that you do, you know that, that are in your practices, that you do every day in your classroom, where you try to ensure that students feel comfortable to be able to ask you questions or that they are ready to learn um, when they walk in and say, 'yeah, ok, I'm ready to learn science or biology or chemistry'?

33. Q: So it's more like, not having a sort of a dichotomy between classes like I'm up here as a teacher, you're here, down here as a student. So how would you describe yourself than, as a, as a teacher, you know if you were just to compare, like for example, some people would say, you know, 'I'm, I'm like a coach,' you know, 'I'm, I'm like a gym coach, I think of my class as a team and we're all trying to do something together, I'm trying to guide them,' um, I've heard of, it's, 'I'm a guide' you know quote on quote, trying to guide students. What kind of analogy would you use? I mean because you talked about this mutual respect, you, you know, so when you said 'teachers are not up here, students are

not down here,' I mean do you, how do you view it? Do you see it as almost equal you know, but you have the final say in the classroom or how exactly?

34. Q: Or, maybe how you describe your rapport with students, like versus maybe um, maybe versus other teachers or other examples? I mean, if you couldn't directly describe it, then how would you compare it?

35. Q: And 'elsewhere' is where? Like other teachers, or?

36. Q: Ok, and is it just a guess, or is this based upon meeting the other teachers or hearing how they discuss students, or...

37. Q: Just along the same lines of like, teaching and what's important to you as a teacher, the other thing you had mentioned, um, when we were talking about the accommodations you had made for the quadriplegic student to come out for the winter field study and you said it's a result of, well, not as a result but partly due to your experience with special education, that you're more cognizant of ensuring that you include all student ability at all different levels. Now, first of all, how did you get into special education, teaching?

38. Q: Wait. How did you agree to take it on in the first place?

39. Q: So you have no say?

40. Q: So, why did you like it the first year?

41. Q: Mhm. So what about it was, was good? Cuz, before I interrupted you, you mentioned that they were all very, or a majority was very, very, very violent, or had violent behaviour.

42. Q: So how do you approach that class when walking into it?

43. Q: Wow. Ok, I've never worked with students like that so I can't, I can't even imagine what, what I would do. I mean, how did you decide to, 'yeah, I'm gonna keep them busy and we're just gonna do hands-on all the time'?

44. Q: That are big?

45. Q: In your class?

46. Q: Right. How did you develop that rapport with them?

47. Q: Ok. Ok. Was it the same level of mutual respect that you were talking about earlier? Like, was it the same rules in that classroom?

48. Q: So your rules then, as a teacher, they're always consistent throughout all your classes?

49. Q: Other than mutual respect, what are your other rules?

50. Q: How do you present that to your class or do you just, or is it...

51. Q: So how did they respond to that, then? When, when they weren't getting the reaction that they thought they would without guns ablazing?

52. Q: Can, can you give me an example? Like I'm trying to, to imagine this. Like, is there a moment or someone that you really remember really just taken aback that you didn't, I don't know, take out a gun, call a police or? [Pause for about 9 seconds]

53. Q: So did you find that after then, that they would still listen to music but then it would be only

54. Q: So, did you find that um, with all these hands-on activities, that, that you did, how did their, because like you said, you know, like they're from very different situations outside of school. How did they respond to the hands-on activities? Like, did you find that they were like, 'Yeah,' you know, 'Let's do more science,' like, did you find that they understood things better, I mean, how did it translate into their grades, like what sorts of things did you notice?

55. Q: So what did you do for that student to de-sensitize?

56. Q: So, for, for the other students who were able like to handle it, did you find that um, like how, how you said that they were able to relate to the theory better because they said, "Oh yeah, I remember doing this, it means this." Did you find that also that it translated into their grades? Like, did you find that it helped improve their grades, the more hands-on activities?

57. Q: Ok. So, when, when you found out that they were able to relate to the other material better, was this by talking to students, or how did you know that that they could relate better?

58. Q: A standard, like pencil paper exam? Oh, so you cannot modify the exam to something else, like let's say hands-on...

59. Q: Wow, so then uh, like what you were saying before that this then, inspire you or like change in some way, where for the other classes that were not special ed, you said, "Ok, we're gonna do more activities." Now, were these activities, quote on quote, "more difficult" than what, what you did with um, your special ed classes, or?

60. Q: So generally the same activity, then?

61. Q: So, when you did more activities with your other students, the non special ed students, I'm not saying that they're not important but because the other students, because their grades were tracked, right? Did you find that the more activities or even going outside, like, did that really help with the understanding but also translate into academic performance?

62. Q: For, um, I mean among the non special ed students?

63. Q: In, in terms of improvement, you mean translated onto a test?

64. Q: Um, what kinds of extra things, like how does that planning for outdoor differ than indoor? Like what kinds of things do you account for, that would be extra, that would take up more time?

65. Q: Because?

66. Q: Um, just to discuss a little bit more about your teaching, um, you did mention your master's thesis when we were talking about the classification system, the Gitxsan one? How do you choose that topic? Incorporating aboriginal perspectives.

67. Q: But is incorporating aboriginal perspective, is that very important to your teaching? This isn't a judgment question.

68. Q: Why is that?

69. Q: Like, when, when would it be good enough in, in your view?

70. Q: How come you don't think it's good enough?

71. Q: So really, no sort of standard or real understanding of aboriginal perspective?

72. Q: So, what I want to know is, what kinds of other things would you say, are important to your teaching? Like if you were to say, "These things are super important to me as a teacher," you know, and it also seems that consistency amongst all your, all your classes is important, you know, to have that same rule um, well, quote on quote, rule or you know, sense of respect. Like, what other kinds of little things, would you say?

73. Q: What is it that you're trying to convey to, to the B.Eds? You know, what is it that you really want to show them?

74. Q: And you say that that's really what you try to convey most?

75. Q: So I'm just kinda wondering, how would you uh, how would you describe your, your teaching style?

76. Q: Are you, like you, for example...you sound, from what we've been talking about, you sound like the most important thing is that the students are the focus, you know, how do they learn best, like what's best for them. Because other...

77. Q: So then how would you describe teaching in general? Like, what would you say teaching is to you?

78. Q: How do you reconcile that?

79. Q: Right. No, well, what I mean is not let it get you down? Like, is it just your perspective, like just accept that people like different things?

80. Q: 'You happen not to like science, but I happen to like science?'

81. Q: Ok. So what advice, then, would you give to a, to a B.Ed who's aspiring to be high school biology teacher? You know, they ask, 'What is it really like?' What would you say?

82. Q: So, choose one, one or the other. How do you describe your teaching philosophy, right? Like, what you go into everyday and, and what you do and, how you feel about teaching or, and or, to go back to the previous question I asked earlier, what kind of metaphor would you choose for yourself as a teacher? You know, 'a teacher is like' or, 'the way I teach is like'?

83. Q: And, just a fantastical question, just to end it off at. In an, like, what would be your ultimate ideal teaching situation, where you're like, 'this is my dream teaching job' or, context, like what would it be, what would it look like?

84. Q: Or, do you have an ideal?

INTERVIEW 2 QUESTIONS: SHIERA

The following are the questions I had asked Shiera, in order, during her final interview. (Notes: Filler words, ex. um, mhm, etc. were removed as they did not contribute towards the questions asked.)

Q: Do you remember the first time you brought your students outside?

Q: Well, how bout this, how bout most memorable?

Q: What was the first one that came to mind?

Q: What month did you go?

Q: So it was an early snow?

Q: So like, did you, did they, was there a rope, or something in the canoe?

Q: Wow, so were you delayed, like, what was the outcome?

Q: So what was so memorable about this particular trip? Cuz, it sounds quite...easy.

Q: So, like I mean, from our discussion last time, I mean, you did mention how every term in Bio 20 you do a field study so, why keep going outside? I mean, cuz we touched upon it a little bit that, um, you know, like there's a lot of forms to fill out, you know, organizing money, organizing bus drivers you know, and how much time ahead like, you have to plan for it as well. And like you said, you know, some other teachers, don't go outside I mean, logistically it's way easier if you just stay inside your class. So I mean, what keeps you going outside and doing these outdoor activities with the class?

Q: So then, I guess, how much, when planning these kinds of activities, how much of a factor is student enjoyment? Like, how much do you take that into consideration?

Q: So um, about like student-designed investigations, now did you, was this in the curriculum, what I mean is, how did you get this idea?

Q: So, I mean, other than the accountability issue, like from the IB ok, so, other than that did you feel, from a teaching aspect, from your own self as a teacher, and of course it's important that your students learn these skills did you find that this was a better way for students to develop these type of scientific investigative skills, was by designing their own, as opposed to when you saw them doing recipe-style labs?

Q: So, I mean, would you say from your experience, then like from the first time you did, when you had students design their own investigations, up to now, has there been an increase in kids designing their own investigations? Like in your own class, yeah. That's right. Not only the field study labs.

Q: So, um, is the biggest design, your own investigation one, is that the field study? Is that the biggest one?

Q: Oh. Can you give an example?

Q: Was that an actual student experiment, how aggressive an ant is?

Q: Do you have any student examples?

Q: Who are your role models that you have for teaching?

Q: What was his teaching style like? Like, how would you describe it? Cuz I've never met him, obviously, I never took a class with him.

Q: So, um, how did that impact your teaching, do you think?

Q: How do you know it worked?

Q: Well, what was it?

Q: Is this the field study? Is this the experience that, that you try to give or?

Q: Ok, so what, what is it for this term for what you're teaching. What would you say it is so far?

Q: So, um, who else, then, is a role model in your teaching, would you say, other than [name of role model]? You mentioned your mom was a teacher.

Q: Did that influence your teaching?

Q: Can you give an example in your teaching?

Q: What was the biggest one? Or the most memorable?

Q: How do you hear about these things?

Q: Yeah, exactly. I think that's the worst, when you see it coming, you know, so. It sounds like something, a very strong belief as related to, like an administrative duty, I mean being department head, right? Like, it's your responsibility as department head, what would you do?

Q: So what are some very strong beliefs? Like what can you say for sure, that is definitely important to you when it comes to teaching?

Q: So then how would you, like this whole notion of trust and authenticity and integrity, how do you try and establish that in your class? I mean, what do you think you do as a teacher?

Q: So then, how then would you describe your teaching style from that?

Q: So how do you try and help them out, like in your class? Like, are there any right now?

Q: So, just to touch a little bit more, like um, you mentioned a bit that you had seen these other teachers that you admire and that you try to be all these different ways, how did you come to realize that, just to be you, and, and to teach as, as Shiera?

Q: How did you come up with this idea, anonymous surveys?

Q: Is there a metaphor that you would choose, to describe your own teaching style?

Q: Um, what was it about that and what like, how you said that when you did come back, you felt more confident when teaching but, um, do you feel that it's necessary for teachers to have more content knowledge than students?

Q: Um, some of the examples you gave, um, are the outdoors important to your teaching, would you say?

Q: In general?

Q:Because? I mean you've mentioned several times you can't teach ecology without going outdoors, so then, would you say then that the outdoors, would you say it's more like a, like a teaching tool, like there are different ways of teaching biology, you can do this, this and also go outside or would you say it's part of your teaching philosophy, what you believe...

Q: Um, one of the things you mentioned last time, um, in the previous interview was one of the other things you liked a lot about teaching was how it's constantly changing, right? Like you mentioned, you're always getting a new group of students in, you know, do you try to reflect this enjoyment of difference in your teaching method? Are you always trying something different in how you teach certain material?

APPENDIX J

INTERVIEW 2 QUESTIONS: HAL

The following are the questions I had asked Hal in order, during his final interview. (Notes: Filler words, ex. um, mhm, etc. were removed as they did not contribute towards the questions asked.)

R: Ok. And what year was this?
R: Ok. And how many students?
R: And they're all the same grade level?
R: Oh wow. So you had some repeat travelers with you?
R: Ok so question, 'cause we talked about this a little bit before, how when you brought students to Royal Tyrrell that the other teacher you were working with, how he was like wanted worksheets with them, but, you're more of like, no, you know, if students go there and if they experience it, that they're still going to get something. So what was the schedule like, for this trip?
R: So like, when you're actually there, I mean, was there any, was it more kind of like, touristy, like more like experiencing like the different areas um with the students?
R: Do the kids still talk about this trip?
R: Like when you were there?
R: Are you gonna to do this trip again?
R: So are you gonna do something like this at the school you're at now?
R: With China?
R: And of course you won't be identified in any kind of way. So what I'd like to ask you about today are role models, and um, influences upon your teaching, uh, a little bit about the textbooks that you have written, and um, what it's like at your school, um, and your teaching style. So, those are the things I want to touch upon today if that's ok?
R: And did you have any questions from before? Anything you wanna say?
R: And you had mentioned that they um, were encouraging you to try different ways of teaching and to do different things with your students, right?
R: Did this impact your view of teaching, like as a student teacher, before, before you worked with this mentor teacher?
R: What about um, during your B.Ed. when you were learning how to teach? Like, was that discussed at all?
R: Right Ok. Um, who are your other role models in teaching?
R: Yeah, no definitely. Um, so is there much chance at all now, because now that you're at the same school, understanding that she is more admin, is there a chance to still kinda bounce different ideas, and stuff like that? Like do you still have those kinds of discussions?
R: One of the things you talked to me about last time, you had mentioned when you were student teaching that at first you, you weren't sure if teaching was for you, right?
R: And so what I'm wondering is, is this sense of um, of, of wonder, of, of excitement, and looking at science, is this very important to your teaching? I mean, even just now when you describe, you know, 'why start with biochemistry when you can'hook kids with something else?' Like is this very important to you, to garner, I guess that interest and that actual curiosity?

R: So then, at the end of your course, right? What is it that you want students to take away from your course when they're done?

R: So after your 12 years of experience in teaching related experience then, what can you say definitively about teaching? Like, what can you say for sure? 100%?

R: Ok, so just to touch a little bit more on, on that aspect, I know we talked about previously also, is this sense of wonder and being able to connect to the curriculum in the real world, and this appreciation of science and being able to see, you know, that science really is everywhere, right?

R: Would you say that the outdoors is the best way to showcase all these different types of ideas?

R: And did students really respond to that? Like even the ones who didn't go?

R: Is that, those experiences when you were growing up, it, did that also influence you as a teacher to use the outdoors as well?

R: So just to, like um, a different view point of that, um, you also mentioned about writing textbooks, um, you know, and how you helped develop resources like for textbooks, and you did the, um, science 20, and the 30, right? How did you choose what to include? Um, when you were writing those books?

R: So how would you describe your teaching?

R: What analogy would you use for your teaching?

R: Well what is it for you though?

R: Right? And you had mentioned before um, that you, in teaching general science, that you enjoy the cross-curricular strands and bringing in different aspects, saying you know, 'this is how it connects' And, is that also related to trying to get students to see how different things relate to the world, to try and to get *them* to relate to the world better?

R: Um, again, like, how important is that, um, for you as a teacher? Like, to show them that like science isn't just purely like this fact that you can also have historical relationship, you can even have relationships with completely, what would seem to be a completely unrelated subject, like art and Mondrian paintings?

R: Is that more readily available when using the outdoors? Making the cross-curricular links?

R: And you also mentioned like, your background was honours B.Sc. zoology?

R: Has that influenced um, you at all in how you view teaching? How you view um, biology curriculum?

R: I know it's your first year here, but you think you'll plan this type of trip in future um, years at the school?

R: But I mean, even the smaller type of trips like going to Tyrrell musem?

R: How much support is there from admin and other teachers?

R: So, ok, um, how do you think the other teachers would be, like what kinds of responses?

R: But what's your general feel?

R: So is the outdoors to you, is it a tool, like a type of teaching tool, or do you really feel that it's part of your own teaching philosophy and how you view teaching?

R: So I think those are all of my questions, um, is there anything that you wanted to add from today?