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Preservice Secondary Science Teachers' Experiences and Ideas about Bullying in Science Classrooms

Abstract

Given the prevalence of bullying in schools, it is imperative that preservice secondary science teachers (PSSTs) know how to deal with this issue in the classroom. This is especially important in science, as the content covered in classes can sometimes lead to discussions of race, religion, and sexual orientation, which can be sensitive topics. In this qualitative study, we conducted four focus group interviews in order to examine PSSTs' conceptions of school bullying, their roles as science teachers in relation to bullying, and potential instigative areas within the science curriculum. The research findings indicate that PSSTs are not prepared to effectively deal with classroom bullying and have differing conceptions of what constitutes bullying. In terms of science content, the topics of evolution and genetics surfaced multiple times as instigative topics. When asked what they would do if instigative topics arise in class, the PSSTs were split, with half of them saying they would avoid these topics, while the other half would address them through teaching science as a body of facts. In light of this data, it may be appropriate to include strategies for dealing with instigative topics in preservice science education programs. In addition, there is a need for more research and discussion in this area.

Introduction

"See, that makes me scared. I'm scared to assign groups . . . I've always been terrified, …. thinking about planning my classroom in my head….because, what if I put this nerdy kid next to one of the bullies and he bullies him and I don't see it. …. I almost want to let them pick their groups, but I know the quiet people are going to associate together, and I'm just scared of everything" – Quinn, a preservice science teacher, I1, Lines, 586-591)

Keywords: science, bullying, preservice teachers

Although bullying is not a new occurrence in schools, the topic has received increased attention by researchers since the 1990s as evidenced by a growing number of peer-reviewed publications. The recent focus on school bullying is warranted considering the strong correlation between school bullying and school shootings (Vossekuil, Fein, Reddy, Borum, & Modzeleski, 2002). Furthermore, researchers have documented a high prevalence of bullying in US schools as well as its negative impacts on all those involved (Hawker & Boulton, 2000; Nansel, Overpeck, Pila, Ruan, Simmons-Morton, & Scheidt, 2001; Wang, Iannotti, & Nansel, 2009).

The fatal consequences of chronic bullying have been well documented with numerous young lives lost to suicide and mass school shootings (Berger, 2007). Victims of bullying experience negative social and emotional impacts that can have long-term effects including underdeveloped social skills, decreased self-esteem, poor academic performance, and higher rates of depression and anxiety (Eslea et al., 2003; Hawker & Boulton, 2000; Nansel et al., 2001). Likewise, bullies, "unless they change their ways and their associations, . . . are on a developmental path that turns ugly" (Berger, 2007, p. 106). During high school, bullies sometimes begin to exhibit maladaptive behaviors that frequently result in troubled adulthoods (Nansel et al., 2001; Olweus, 1999). Thus, both bullies and victims are susceptible to negative impacts from their experiences.

An abundance of peer reviewed research examines varied aspects of bullying, including clarifying terminology, describing different types, identifying negative impacts, characterizing bullies and victims, investigating the effects of anti-bullying programs and characterizing effective programs (Beran, 2005; Berger, 2007). Teachers play a significant role in managing school bullying and in the success of anti-bullying programs (Allen, 2010; Pepler, Smith, & Rigby, 2004). A limited number of studies have examined teachers', let alone preservice teachers', attitudes toward and perceptions of bullying (Beran, 2005). Nevertheless, a connection has been established between bullying, classroom management, and teacher practices (Allen, 2010). "Bullying doesn't occur in a vacuum. A host of factors contribute to its existence, and one of them is how teachers manage their classroom and respond to inappropriate student behavior" (Allen, 2010, p. 11). However, more needs to be known about how contextual factors play out in classrooms in ways that prevent or promote bullying behaviors.

Most research to date has explored bullying in a macro-educational context. In our research, we apply a more focused lens in order to examine classroom bullying in the context of a particular content area—science. Although all content areas have unique aspects, the science classroom poses a particularly productive context in which to examine bullying as a result of commonly held misconceptions about the nature of science knowledge and the scientific discipline. Such misconceptions may be related to: who does science (e.g, only white males can do science), aspects of science as a discipline (e.g, science is objective, presents

an absolute truth, is superior to other ways of knowing), and how science relates to other disciplines (e.g., science is incompatible with religion). If teachers fail to establish an environment that is accepting of all students, then they may unwittingly promote antisocial behaviors and bullying (Pellegrini & Blatchford, 2001).

In order to better understand how bullying relates to science content, we first examined how science content interacts with the classroom environment to facilitate bullying. Also, we sought ways to contribute to the existing literature concerning preservice teachers' perceptions of their roles in relation to bullying by examining how PSSTs approach their content within bullying situations. The specific questions that guided this study were:

1. What are the content specific issues that science teachers are confronted with in relation to bullying?
2. How do PSSTs conceptualize their roles as science teachers in relation to classroom bullying?

Review of Literature

Prevalence of School Bullying

Nansel et al. (2001) examined a representative sample of over 15,000 students in the US from grades 6 through 10 and found that 29.9% of them were involved in bullying, with 13% being identified as bullies, 10.6% identified as victims, and 6.3% identified as both. Wang, Iannotti, and Nansel (2009) investigated the prevalence of four types of bullying and found that, in a representative sample of more than 7,000 students, 53.6% reported being verbally bullied, 51.4% reported being socially bullied, and 20.8% reported being physically bullied. These findings, while not completely consistent, nevertheless indicate that bullying in schools is a significant problem and impacts a large number of students.

Definition and Types of School Bullying

We will follow Nansel and Overpeck (2003) in defining bullying as an aggressive action that involves an imbalance of power, is repetitious, and intends to harm. The two main types of bullying are overt and relational. Overt bullying can be either physical or verbal. Physical bullying is very obvious, and often gets the most attention from students, teachers, and administrators. Verbal bullying is often more difficult to discern, and includes name-calling, teasing, and verbal threats. However, Perhaps the most invisible form of bullying is relational bullying. Bauman and Del Rio (2006, p. 220) write that "[r]elational bullying includes social exclusion ('You can't play with us'), spreading rumors ('Did you hear...?'), or withholding friendship ('I won't be your friend if you...')." Additionally, in recent years, the term "cyberbullying" has been coined, and is reflective if a higher prevalence of bullying taking place electronically and over the internet (Berger, 2007).

Role of the Teacher and the Classroom Environment in Relation to Bullying

When at school, students spend the majority of their time in classrooms. Thus, when addressing school bullying, "the importance of teachers cannot be overemphasized" (Bauman & Del Rio, 2006, p. 220). For instance, Mayer (2002) found a connection between the classroom environment and the likelihood of bullying behaviors. He concludes that authoritarian classrooms promote antisocial and bullying behaviors. He characterizes authoritarian classrooms as those that have a strict adherence to rules with little or no flexibility, provide few, if any, opportunities for child autonomy, rely heavily on punitive methods, have disjointed relationships between teachers and administrators, present unclear rules with inconsistent enforcement, and fail to embrace student diversity. Allen (2010) established a connection between bullying, classroom management, and teacher practices, stating that classroom management moves beyond managing behaviors to implementing effective instruction. In order to create more positive and caring environments, teachers need to create learner-centered environments that are non-authoritative and provide flexible and varied environments that focus on promoting academic, moral, and social well being (Evertson & Neal, 2006).

Antibullying programs tend to rely heavily on teacher participation (Beran, 2005). Teachers are expected to attend training or professional development to enhance their understanding of bullying and then implement learned anti-bullying strategies with their students—they are expected to identify and remedy bullying situations. The importance of teachers is supported by Kallestad and Olweus (2003) who found teachers were "without doubt the key agents of change" when implementing the Olweus Bullying Prevention Program in Norwegian schools. In another study, Akiba, Shimizu, and Zhuang (2010) examined the relationships between teachers and students (teacher bonding) and the role that this plays in dealing with bullying. They found that "[increased] teacher bonding was significantly associated with [reduced] student victimization and bullying" (p. 386). In addition to teacher bonding, they examined several other student factors, including GPA, gender, socioeconomic status, and grade level, which proved not to be significant in bullying prevention. These findings provide a strong indication that teachers play very important roles in bullying prevention and intervention.

Teacher Knowledge and Bullying

Despite overwhelming evidence of bullying issues, many preservice teachers leave their university or college teacher preparation programs underprepared to deal with issues of bullying (Lin, Lake, & Rice, 2008). According to Merrett and Wheldall (1993), about 75 percent of the secondary teachers involved in their study reported that they did not feel satisfied with their level of preparation in effective classroom management, including dealing with bullying. Beran (2005) also examined preservice teachers' attitudes towards bullying, finding that preservice teachers are concerned about the problem of bullying and feel a sense of responsibility for dealing with it. However, they lack the confidence to take action against bullying. Likewise,

Boulton (1997) found that most inservice teachers in his study, despite their years of teaching experience, lacked confidence in dealing with bullying and that almost ninety percent expressed interest in more training. Holt and Keyes (2004) echoed this, finding that both preservice and inservice training on bullying prevention and intervention was severely lacking.

Literature on bullying has also documented that many students and teachers have misconceptions about bullying. Craig, Bell, and Leschied (2011, p. 22) state that one of the main misconceptions surrounding bullying is the belief that "bullying is a 'normal' developmental phase of childhood." They argue against bullying being a necessary part of schooling by pointing out that bullying negatively impacts academic performance. Also, preservice teachers view physical bullying as serious and are likely to intervene; however, they often downplay the seriousness of relational bullying and are less likely to intervene (Bauman & Del Rio, 2006). Thus, teachers may have misconceptions about bullying that impact their practices in the classroom.

Science and Bullying

Research has indicated that bullying is dependent on the environment in which it occurs. For example, it is more likely to occur in unsupervised areas, such as in lunchrooms, playgrounds, and hallways, than other areas (Card & Hodges, 2008). Likewise, science classrooms may provide a unique environment that encourages bullying for an entirely different set of reasons. Science education research has long grappled with the often tense relationship between science and society. On one side, there are those who view science as a source of unquestionable, objective, and absolute truth. However, as demonstrated by a history which includes justifications of slavery and genocide, others believe science is not unbiased or always right. Additionally, Goldston and Kyzer (2009) point out that many people question the role of science in education and advocate for the inclusion of religion in schools. In particular, controversial topics like evolution are targeted due to their perceived differences from religious teachings. Research studies have concluded that PSSTs also hold misconceptions about the nature of science knowledge and the scientific discipline (Bell, Lederman, & Abd-El-Khalick, 2000). Furthermore, there is a movement within the science education community to make science curriculum more inclusive of non-western ideas of science such as indigenous knowledge (Stanley & Brickhouse, 1994).

Theoretical Framework

We worked within a social constructivist framework because we believe that knowledge construction is heavily influenced by cultural and societal relationships (Kim, 2001). Accordingly, science is not an entity waiting somewhere in the universe for humans to discover, but instead is a human construct whose characteristics are as tentative as the knowledge it builds. Likewise, bullying occurs in a social context. The interactions between bullies, victims, and observers affect how they interpret and understand their world and their relation to it. We adopt several tenets of social constructivism: social reality is socially constructed and only exists because of human creation, knowledge is a product of society, and learning is a social process (Kim, 2001). Learning occurs as individuals interact with each other and their ideas are evaluated and modified (Bodner, 2007). Thus, through having discourse with groups of PSSTs, we sought to make meaning of their experiences of bullying and the science curriculum and how that impacted their views on their roles as science teachers.

Methods

Research Design and Data Collection

Our study utilized qualitative methods (Merriam, 2009) because we aimed to generate knowledge that informs theory. Our study examined PSSTs' experiences with bullying in science classroom situations in order to identify instigative topics and understand the different pathways PSSTs may venture along while dealing with these topics. Due to the exploratory nature of this study, we used an emergent design, which allowed us to adapt our inquiry as we gained a deeper understanding of the PSSTs' experiences with bullying and how those experiences influenced their conceptualizations of their roles as science teachers (Patton, 2002).

We collected data from twenty-one PSSTs who were enrolled in a large public university in the southeastern United States. Table 1 depicts the gender and student academic degree level of the participants for each group. The majority of the participants were white with two African Americans and one Asian American. The PSSTs had not begun their student teaching, but were conducting classroom observations of both middle and high school science teachers. All of them had taught at least one 5-10 minute lesson with high school students. Some of them had a few more opportunities to practice teaching.

We digitally recorded four semi-structured focus group interviews. Each interview lasted for approximately one hour and included five to six PSSTs. Both researchers were present for each of the focus group interviews with one researcher moderating the discussion and the other operating the audio-recorders (Patton, 2002). The author moderating the focus group discussions had built a rapport with the participants because she served as a teaching assistant in a course in which they were enrolled.

We conducted focus group interviews as opposed to individual interviews for two reasons. First, all people have diverse experiences with bullying and, as preservice teachers, our participants had experiences with bullying from the perspective of both students and teachers. However, to our knowledge, the PSSTs had not participated in any courses on bullying in schools. Thus, in focus groups the PSSTs had the opportunity to share their experiences and understandings and learn from each other. Utilizing individual interviews would lose the responses the PSSTs had to each other's experiences and would have limited our understanding. Secondly, due to the

Table 1: Focus Group Breakdown by Gender and Level of Academic Degree

Focus Group #	Female	Male	Undergraduate	Graduate
1	3	2	2	3
2	3	2	4	1
3	3	3	2	4
4	5	0	1	4
Total	14	7	9	12

exploratory nature of the study, we were not concerned with studying any one PSST's experiences and understandings in extreme detail. Rather we wanted to create a group voice and promote discourse about bullying. This allowed us to identify overall themes in the group's experiences and conceptualizations.

Data Analysis

The transcripts of the focus group interviews served as the primary source of data, and we used the constant comparative method to analyze our data. Constant comparative analysis emerged from the work of Glaser and Strauss in 1965 and thus is closely associated with grounded theory (Charmaz, 2006). However, the constant comparative method is an analytic tool that can be employed in various methods and thus subsumes the paradigmatic orientations of the framework in which it is employed (Freeman, 2008). Throughout our analytic process, we allowed the data to direct the development of increasing conceptual and theoretical understanding. We initially coded each transcript through the process of line-by-line coding; we simply summarized the data using descriptive words written as gerunds (Charmaz, 2006). Once further along in the analytic process, we used focused coding, which allowed us to compare codes and organize them into categories. Through this process, many codes and categories were eliminated and developed and larger themes began to emerge.

From our perspective, codes refer to descriptive words or phrases that describe what is happening in the data. For example, one of our codes is called "avoidance strategies." This code describes data about specific methods the PSSTs planned to employ to avoid addressing instigative topics that arose from their students. Categories are more conceptual, combining multiple codes to demonstrate the relationship between them. For example, the category called, "approaches to teaching about instigative topics," combines two codes, which provide information about the strategies the PSSTs planned to utilize when confronted with instigative topics.

Limitations

Although we conducted four focus group interviews with a total of twenty-one PSSTs, we did not utilize any other methods of data collection to further enrich our interpretations. A more detailed study is needed to construct a more complete understanding of bullying within science classrooms in relation to PSSTs' conceptualizations about their roles as teachers. For example, education research has well documented that what teachers intend to do and what they actually do within their classrooms is not necessarily the same. Therefore, we can only make statements about what PSSTs say they will do. Also, because we conducted focus group interviews it is possible that minority opinions were not shared. Lastly, given the qualitative nature of our study, and given the fact that our participants came from one university and lacked racial/ethnic diversity, our results are not generalizable.

Findings and Discussion

During analysis, several themes emerged from the data, and each theme will be discussed with its corresponding research question. Before discussing our emergent themes, it is important to provide the context in which the PSSTs discussed bullying. The PSSTs identified several types of bullying including verbal, physical, and cyber. They agreed that bullying occurs when one person or a group of people cause harm to another person or group of people. However, they disagreed in their definitions when attempting to delineate bullying from the acts of peer pressure, "picking on," or playing pranks. A major point of contention for the PSSTs about what constitutes bullying involved intent versus impact. Some of their definitions of bullying included the caveat that inflicted harm be intentional, whereas others held that intent was irrelevant. Thus, the PSSTs defined bullying as a harm-inducing action accompanied by intent or impact. They did not characterize bullying as being repetitious or involving an imbalance of power.

All of the PSSTs were united in their belief that bullying is wrong. However, there was a disagreement amongst them about intervening in cases of classroom bullying. Some PSSTs believed that their role involved providing a safe environment for all of their students and would act to stop and prevent bullying in their classrooms. Others believed that it is a part of life and cannot be prevented or stopped. Therefore, they would not necessarily intervene in cases of classroom bullying because students needed to learn effective coping skills. For example, in describing her role as a teacher in relation to classroom bullying, Audrey stated:

> You can't shelter these kids their entire life. It's real life. It's going to be said. It's going to happen. And I feel like some of them, at one point in time in their life, need to hear something like that, just to realize the world's not sunshine and rainbows. (I3, Lines 470-471; 473-474)

Lastly, the PSSTs discussed their roles as authority figures in relation to bullying. Some of them stated that they could not control the opinions, thoughts, statements, or actions of their students. Although they believed that they would be responsible for dealing with bullying, they felt they lacked any real authority to effectively address the problems. For example, in explaining the precarious situation of teachers, Sam stated:

> Sometimes I feel it's unfair, the amount of responsibility teachers get because there are so many limitations to actually deal with that information . . . you can do certain things but really what can I do to the bullies? . . . I can't break up their schedule; I can't separate the people;

> I'm stuck with this and if I do something and it angers someone, I'm stuck with the consequences and that may hurt the child's progress. (I2, Lines 800-804)

Therefore, some of the PSSTs held the belief that bullying is a part of life, and this belief impacted their decision to abstain from intervening in cases of classroom bullying. Probably due to their lack of experience in managing classrooms, some of the PSSTs also lacked the confidence in their ability to properly deal with bullying.

Research Question 1: What are the issues that science teachers face with bullying in relation to the content they teach?

The PSSTs shared their personal experiences, both as students and preservice teachers, in which they had witnessed students being bullied during the teaching of certain science topics. Reflecting on these experiences, the PSSTs brought up evolution and genetics as two topics within the science curriculum that led to bullying. In regards to evolution, they observed students being bullied about their personal beliefs and their race. For example, the PSSTs stated that they witnessed some students being bullied because they accepted the theory of evolution and other students being bullied because they did not accept the theory of evolution for religious reasons. Brittany shared her experience, in which a teacher had difficulty addressing a bullying situation during an evolution lesson, stating:

> No, ….we actually did have that at my high [school] class that I'm observing. Second period, there was one girl who immediately brought up the fact that she felt that evolution was against her religious belief and …. 20 students were immediately like, "you're dumb" . . . they actually said that to her and then one student kept going on and on for about 10 minutes. And the teacher was kind of trying to steer it away from the whole "you're dumb" thing, and she was kind of saying . . . this is religion, this is science. I'm not qualified to teach religion, we can only discuss science in here. But it still kind of didn't handle the fact that everybody said "you're dumb." (I3, Lines 417-423)

Also, during the teaching of evolution, the PSSTs recalled several instances of students making statements about black races. For instance, they cautioned against discussing the origins of man being from Africa because students might incorrectly conclude that black races are "more primitive" (I1, Line 532) and white races are "more evolved" (I1, Line 526).

In regards to genetics, the PSSTs indicated that students could be bullied based on their physical characteristics and/or personality traits. Kurt indicated that a short student was bullied for having "weak genetics" (I3, Line 407). Furthermore, they stated that students could potentially ask teachers about the genetics behind race and sexual orientation. Although students should feel comfortable in expressing their curiosity about the genetics of any trait, the PSSTs were concerned that the discussions could lead to negative verbal statements. For example, in sharing a story about a discussion on the genetics of race that occurred in one of her college classes, Melanie explains that one student stated, " . . . we're not prejudiced against other races because of their skin color, it's just the way they act, it's just their culture, it's gross" (I1, Lines 540-541). In regards to sexual orientation, the PSSTs were conflicted in dealing with the nature/nurture question because they feared that gay students would be further ostracized if students believed that sexual orientation were a choice.

In summation, the PSSTs identified a potential for bullying during the teaching of evolution and genetics. We do not intend to suggest that during the teaching of these topics that issues of classroom bullying will necessarily arise but simply that the content can create situations in which students are bullied. Furthermore, we do not posit that evolution and genetics are the only two areas within science that can lead to classroom bullying, but are merely the two areas that our participants highlighted. The PSSTs did not mention content specific examples of bullying with earth science, chemistry, or physics although some of them were content specialists in these fields.

Research Question 2: How do PSSTs conceptualize their roles as science teachers in relation to classroom bullying?

Three themes emerged during data analysis about the PSSTs' ideas concerning their roles as science teachers in relation to classroom bullying: whether to address or ignore instigative topics, belief in science as a body of facts, and feelings of unpreparedness. The PSSTs discussed how they might approach teaching evolution and genetics, topics they previously identified as instigative. Some PSSTs indicated they would employ strategies to avoid addressing aspects of these topics. For example, some stated they would ignore their students' questions or comments involving these topics. Tina shares, "I would not know how to address a question [in regards to questions about race and ethnicity] if it was asked and I would not answer it" (I2, Lines 396-397). Other PSSTs indicated that aspects of these topics are not relevant to the science curriculum, and, after explaining the irrelevance to their students, they would refuse to address the issues any further. Erin indicated, ". . . you don't have to address it [issues of genetics and race] . . . you could just say we're not talking about that" (I2, Lines 366-367). Still, other PSSTs indicated that they would direct students to ask their parents or to read the literature and to develop their own conclusions.

Secondly, some of the PSSTs indicated that they plan to address instigative aspects of evolution and genetics if brought up by their students. All of the PSSTs who planned to address these topics indicated they would present the scientific research behind the issues and present science as a body of facts. For example, in responding to how he planned to deal with racist comments during an evolution unit, John stated:

> I think taking a purely scientific approach . . . once I, say this is what happens, and it has nothing to do

> with ethnicity or the background or the culture or anything like that. It's just simply the history from the skulls and the bones. (I1, Lines 556-558)

Kim, Jerry, and Lisa, in discussing how to handle questions about the genetics behind sexual orientation, respectively stated:

> I don't know that I want to have too much of an opinion. I just want to show them what's out there, what the facts are. (I1, Lines 690-691)

> I would be interested to see some research about it because coming from a purely scientific stance on it, if you can say look, here are these studies and they've shown that it's a natural thing . . . in nature and, and in humans, but I haven't, I mean I think it's natural. (I1, Lines 706-709)

> . . . it hasn't been proven that it's genetic, . . . but if they, they want to try to push that issue, then be like, . . . bring in something, bring in articles that says this is genetic. (I3, Lines 549-551)

Furthermore, Marley stated that her role was to teach the science content, "which is not socially influenced" (I1, Line 1008).

Ignoring students' comments and questions is pedagogically problematic to say the least. However, when teachers ignore students' comments and questions that involve bullying such as black races being "primitive" or short students having "weak genetics," then students suffer negative long-lasting consequences such as a decrease in academic performance, low self-esteem, and depression (Hawker & Boulton, 2000; Nansel et al., 2001). We applaud the PSSTs for attempting to address bullying in their classrooms; however, presenting science as a body of facts and believing that it is not socially influenced is also problematic and contradicts the pedagogy we hope to promote in science education. By viewing and teaching science as a body of facts, the PSSTs relegate science to a position of authority. Science does not purport to make ethical decisions, and the lack of knowledge on this matter demonstrates that the PSSTs' may hold common misconceptions about the nature of science knowledge as indicated in other studies (e.g., Bell et al., 2000). It is also possible that the PSSTs lack content and/or pedagogical knowledge, which reveals itself in their inaccurate representation of the nature of science knowledge. For example, a PSSTs, who lacks the content knowledge to explain the biology of race or the pedagogy to effectively manage a classroom, may utilize what they feel is the best strategy at the time, which is to present science as a body of facts even though they may not view science as a body of facts. More research is needed to understand the rationale behind the PSSTs decisions.

Regardless of whether or not the PSSTs planned to avoid or address controversial science topics that arose in their classrooms, they all indicated that they felt unprepared to appropriately handle these issues. The PSSTs expressed a fear of addressing homosexuality and race, and the teaching of evolution because they believed that they would make the situation worse. In particular to addressing homosexuality and evolution, the PSSTs also feared being bullied themselves or losing their jobs. In discussing the consequences of addressing homosexuality and evolution, Sam and Quinn stated respectively:

> I had a teacher [who was] fired because I don't know if she didn't word it [in regards to evolution] correctly or . . . she forget to throw in that "this is just a theory" thing. I don't know if she really angered a lot of the right parents, . . . previous experiences scare you about it . . . (I2, Lines 463-467)

> But I remember in high school, one of my teachers did that same thing [discussing homosexuality] and coming from a small town, a bunch of the . . . kids went home and told their parents my teacher said being gay was cool and natural and they kind of retaliated against him and so I'd be afraid of that too. He almost got in a lot of trouble for that. That's what his argument was. That they were like "you don't need to have that in the classroom, that's for something out of the classroom." He's like, "no, it's directly related to what we're talking about; it's science." (I1, Lines 689-693; 698-702)

Since all of the PSSTs stated that they felt unprepared to appropriately address instigative topics within their classrooms, the conclusion is that they need more training and support in dealing with bullying.

Implications

A variety of contextual factors contribute to the occurrence of bullying in classrooms. Teacher practices should reflect a complex understanding of science content, a deep understanding of the nature of science knowledge, and sophisticated pedagogical knowledge. Without being equipped with this set of skills, teachers cannot promote safe learning environments and effectively manage bullying situations whether they arise from the science curriculum or from other instigative factors. Several research studies indicate that both preservice and inservice teachers are unprepared to effectively manage issues of classroom bullying (Boulton, 1997; Lin, Lake & Rice, 2008). Our study not only supports the literature, but also, shows that preservice science teachers lack the skills needed to address bullying situations that specifically arise from the science curriculum. Therefore, the implementation of courses dealing with classroom bullying is vital to providing an adequate preparation for science teachers. These courses need to provide opportunities for PSSTs to develop and discuss viable strategies to effectively confront bullying issues that may arise in science classrooms. At the very least, our study highlights the need for discourse on the issues of bullying in general and bullying situations arising from the science curriculum. Dialogue is vital in order to build communities that allow for safe classroom environments conducive to learning for all teachers and students.

Future Directions

We believe that our study points to potential new lines of research within science

education. We suggest several future lines of research further examining the influence of science curriculum on the classroom environment. First, our study identified areas within the science curriculum that can promote classroom bullying, but a closer examination is needed to further examine bullying in science classrooms and its prevalence. For example, the extent of teachers' content and pedagogical knowledge as well as their understanding of the nature of science knowledge impacts their ability to effectively manage their classrooms. However, to what extent different types of knowledge allow teachers to promote safe environments conducive to learning is unknown. For example, do science teachers present science as a body of facts when navigating instigative aspects of genetics because they lack an understanding of the nature of science knowledge or because they lack effective pedagogical skills? Furthermore, teachers' knowledge and conceptions of bullying impacts their instruction, but how does it impact their science instruction? Lastly, we also suggest an examination of the school communities' (teachers, students, parents, and administrators) attitudes towards science and how these attitudes promote or hinder bullying behaviors in the classroom towards students and teachers.

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