Spring 4-29-2022

Middle School Science Teachers' Vulnerability in the Written Discourse of a Professional Learning Community

Eliza Jacobs
University of Maine, eliza.jacobs@maine.edu

Recommended Citation

MIDDLE SCHOOL SCIENCE TEACHERS' VULNERABILITY IN THE WRITTEN

DISCOURSE OF A PROFESSIONAL LEARNING COMMUNITY

By

Eliza Jacobs

B.A. Hood College, 2015

A Thesis

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Master of Science

(in Teaching)

The Graduate School

The University of Maine

May 2022

Advisory Committee:

Dr. Elizabeth Hufnagel, Associate Professor of Science Education, Advisor

Dr. Michael Wittmann, Professor of Physics

Dr. Rebecca Buchanan, Assistant Professor of Curriculum, Assessment, and Instruction

MIDDLE SCHOOL SCIENCE TEACHERS' VULNERABILITY IN THE WRITTEN DISCOURSE OF A PROFESSIONAL LEARNING COMMUNITY

By Eliza Jacobs

Thesis Advisor: Dr. Elizabeth Hufnagel

An Abstract of the Thesis Presented
in Partial Fulfillment of the Requirements for the
Degree of Master of Science
(in Teaching)
May 2022

Vulnerability is omnipresent in personal and professional human experiences (Gilson, 2011; Lasky, 2005) and an unavoidable condition of work as a teacher (Bullough, 2005; Kelchtermans, 1996). It plays a role in teachers' interaction with themselves, their students, and their professional communities, as they engage in making sense of their role in these social environments (Uitto, Kaunisto, Kelchtermans, & Estola, 2016). This study examined the written reflection journals by 12 middle school science teachers in a professional learning community (PLC) in New England. Teachers engaged with each other to co-construct knowledge and emotional understanding of their practice within this professional community. By examining teachers' expressions in the discourse of their written reflections, vulnerability was brought to the forefront as a situated, relational way in which we open ourselves up by breaking from the expected norms of the space and outcomes of sharing. There was no existing method for analyzing vulnerability in this context therefore, the project also addressed the development of methodological processes in educational research focusing on vulnerability. Hufnagel & Kelly's (2018) methodological considerations for examining emotional expressions informed the process along with conceptualizations of vulnerability. By examining the subject (aboutness) and

discursive features of teachers' expressions of vulnerability it was made salient what teachers'

expressed vulnerability *about* and the *ways* in which they did so. Previously, orientations to

vulnerability across all disciplines have been toward minimization, rather than leveraging its

necessity and importance in human connection (Gilson, 2011). While this thesis progressed

research on vulnerability in education, it remains important to expand the spaces within which

we have examined vulnerability to both develop and expand conceptualizations of teachers'

professional experiences and the ways in which we can support them.

ACKNOWLEDGEMENTS

Rebecca, you asked open and challenging questions at every meeting point that helped me to continue to move my thinking forward. You took the time to support me as I started to think about the path unfolding following graduate school. You have been forthcoming with wisdom and guidance on this project, as well as the field of education research. I am so grateful for the way you reached out to help me see my belonging and capabilities as a young researcher during challenging moments. I learned a lot from you about how I hope to offer a hand to those who come after me.

This has been a uniquely open and iterative thesis process. My committee has given me so much latitude to explore, find my way, and my voice in this work. You have each played individually important roles, as well as created a collective web of support and expertise. Being supported in complete intellectual curiosity by such wonderful mentors has been one of the greatest opportunities of my life. I would choose all of you over again a hundred times to guide me through this process.

My mom, Grace, is a dedicated and passionate expert teacher. She retires June 2022, just after I have finished this thesis. It has been unique and special to have once worked in the same school and now both be wrapping up major chapters in our professional lives in education. Dad, Caroline, and Jacob: you have listened, asked questions, provided laughs, and been supportive of my work these past couple of years. Thank you.

My lifelong best friend, Sam Auty, you have been with me through the deepest, darkest phases of this project. You have always shone the light and reminded me what I am capable when I wasn't sure. This often included Thai takeout on our couch, one of the countless things about our 20-year relationship for which I am forever grateful. To know each other in another

way after all these years is a gift. Our time living and working side by side will always be one of my most cherished times in our lives.

Even with all these incredible people, none of this work would have been possible without the reliable housing, income, and mental health resources I had access to these past couple of years. Being able to care for my health, wellbeing, and maintaining a sense of self was the foundation which allowed me to see the research to this point. This project has pushed me personally to further explore and understand so many aspects of myself. It has been a time of immense professional growth in which I have discovered passion and direction. This project is truly foundational for me and the process of creating it has been profound. I am incredibly proud of this thesis and so grateful that the people around me believed in it as much as I did.

TABLE OF CONTENTS

Chapter

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Vulnerability is emotional (Gilson, 2011, 2018) and teachers' emotions shape their

practices (Hufnagel, 2019). To divorce emotion from the experience of teaching and learning is

to silence a universally influential aspect of teachers' work (Alsop, 2005). Affective experience

and reason are inexplicably linked, yet dualism is pervasive in orientations to science teaching

and learning (Alsop, 2005; Hufnagel, 2019). This is particularly important for science teachers

because the intellectual field of science widely positions itself as objective (and opposite) to

emotion (Reiss, 2005). This influences teachers' interaction with themselves, their students, and

their professional peer communities, as they engage in making sense of their role in these social

environments (Uitto, Kaunisto, Kelchtermans, & Estola, 2016). Beyond this, the process of

learning is inherently uncomfortable (Jaber, Hufnagel, & Radoff, 2021). Professional learning

and evolving professional practices are wrought with emotions (Buchanan & Mills, 2020). As

such, science teachers are positioned at the crux of a field which widely silences emotion as they

seek to engage in the uncomfortable and challenging experience of professional change. This

constructs a space of discomfort within which it is natural and unavoidable to experience

vulnerability. Despite its universality, there remains a large gap in research-based understanding

of vulnerability and especially focusing on teaching and learning (Bruk, Scholl, & Bless, 2018;

Zembylas, 2017).

An early hurdle in this thesis was the nature of vulnerability as an undertheorized

construct. This informed the goals of the study as there was no existing methodology for the

study of vulnerability in this context. This contributed to the two primary aims of the thesis: a) to

develop a methodological approach to identify vulnerability in written discourse and b) to examine the expressions of vulnerability in the written discourse. In addition to methodological gaps in the extant research, there was also no agreed upon definition of vulnerability (Bruk, Scholl, & Bless, 2018). I drew from Gilson's (2011, 2013, 2018) conceptualization to develop my own orientation to the construct. I defined it as a situated, relational way in which we open ourselves up by breaking from the expected norms of the space and the outcomes of sharing. I also conceptualized vulnerability as an emotional and affective experience. The norms and expectations for participation and affective expression in groups are co-constructed through discourse (Hufnagel, 2018). As vulnerability is affective, discourse analysis methods were used to make salient how vulnerability arose in the written reflection journals of 12 middle school science teachers, as well as what their vulnerability was about.

An open, iterative, and abductive process was used to identify what counted as vulnerability, contributing to the first aim of the study (developing a methodological approach to identify vulnerability in written discourse). Attending to discursive features allowed me to identify primary groupings which were in and contributed to the conveyance of the vulnerability. Focusing on what teachers were expressing vulnerability about allowed me to contribute toward the second aim of the study: to examine expressions of vulnerability in the written discourse. As emotions have an object and are about something each expression was analyzed for its *aboutness* (Hufnagel, 2015). Examining patterns in and across categories of *aboutness* in the written journals made salient what teachers were predominantly expressing vulnerability about. Both aims of the study ultimately contributed to further clarity on examining expressions of vulnerability in written discourse. There have been calls for further study to better understand and support teachers in attending to emotional experiences (Buchanan & Mills, 2020; Hufnagel,

2019) and I echo those calls as well as one to focus on further elucidating vulnerability in

education research.

CHAPTER 2

LITERATURE REVIEW

This chapter outlines the extant literature relevant to this thesis. These spaces include professional learning, emotional sharing, emotion and affect in science education, and more generalized conceptions of vulnerability. I conclude by discussing philosophical explanations of vulnerability which I drew on in order to develop by conceptualization of vulnerability used for this thesis.

<u>Professional Learning Communities</u>

A typical professional learning community (PLC) is one where teachers "do not teach together in the classroom, but who gather outside the classroom to discuss common aspects of the practice" (Gallo-Fox, 2010, p. 110). These communities serve as a solution for the system constraint of isolation teachers have felt in the existing education system (Gallo-Fox, 2010; Hargreaves, 2001). PLCs allow teachers to share similarities, differences, and co-construct progression in their professional practice (Gallo-Fox, 2010). Ongoing professional development or learning remains an expectation of teachers in the United States throughout their careers, therefore it remains of high importance to teachers as well as administrators (Avalos, 2011). A teacher's professional development (PD) begins early in their career as a pre-service teacher where they begin to develop their relationship with students, their professional peers, administrators, and parents (Bullough, 2005). PD has a wide range of goals, structures and expectations that are largely dictated by teacher, school, and district needs (Avalos, 2011).

Teacher peer group work, the basis of PLCs, is an opportunity for personal connection and professional growth (Kemmis, Heikkinen, Fransson, Aspfors, & Edwards-Groves, 2014). Teaching is an emotional practice not just on an individual basis, but amongst colleagues (Hargreaves, 2001). Working in team or group settings is a challenge in any setting, with education being no exception. Negative emotion and conflict amongst colleagues have been identified as challenges and contribute to a culture of conflict-avoidance amongst colleagues (Hargreaves, 2001). This finding aligns with the avoidance of discomforting spaces. Spaces of discomfort also include learning and vulnerability, both of which are impactful in this thesis.

Reflective work is prevalent in teacher professional development (Avalos, 2011). The education research community has maintained focus on that space and examined ways in which reflection serves to address teacher needs, share and process emotion, implement change, as well as a variety of other applications (Avalos, 2011; Day & Leitch, 2001). While reflection is a powerful tool, it is not the only one which teachers and facilitators use to address identity, agency, emotion, and other affective aspects of the profession (Avalos, 2011; Zembylas, 2005b). Uitto et al. (2016) used a narrative approach and interpretive framework in order to analyze teachers' self-understanding within their peer group. They used Kelchtermans (2009, 2011) sources of vulnerability: "teachers' inability to control essential working conditions, difficulty to prove one's effectiveness as a teacher, and the inevitable uncertainty in their judging and decision making" (Uitto et al., 2016, p. 13). They made salient that vulnerability was a component of teacher self-understanding by analyzing incidents in which teachers' felt emotion, when they wavered in their sense of self as a teacher, or self-esteem was in question regarding external pressures from colleagues, supervisors, parents, or other conditions of their work (Uitto et al., 2016).

Teacher vulnerability, in terms of the above conception, was found to be inherently related to and a part of teachers' self-understanding, and thus professional identity (Uitto et al., 2016). The co-construction of teacher self-understanding and expression as a part of a peer professional group were found to be important in continued reform of teachers' professional culture (Uitto et al., 2016).

Emotional sharing

Emotions in a sociocultural context are "a dynamic ongoing process that is constructed in the context of interactions, relationships, and culture" (Boiger & Mesquita, 2012, p. 222). Professional learning communities are a space in which teachers disclose their emotions. Emotions and emotional expression are inseparable from the teachers' work in all dimensions including instruction and professional development (Hargreaves, 2001; Zembylas, 2004, 2005b). Beyond this, as a highly social profession, the sharing of emotion amongst teachers, their colleagues and their students influences the emotional landscape (Hargreaves, 2001). Sharing emotional information or emotions themselves has a wide range of consequences in interaction (Barasch, 2020). Whether a positive or negative disclosure, all hold the capacity to bring us closer to one another and deepen our relational bonds (Graham, Huang, Clark, & Helgeson, 2008).

The sharing of emotional experiences is imbued in personal and professional life, and is a contributor to the situated, relational nature of professional relationships (Rimé, Bouchat, Paquot, & Giglio, 2020). While we might first conceptualize of emotional sharing as happening amongst trusted friends or colleagues, strangers or unknown audiences are also often on the receiving end of emotional disclosure (Peters, Kashima, & Clark, 2009). This has become especially salient in the age of web connectivity and social media as we have increased choices

for sharing spaces and can more easily divorce the face-to-face experience of the receiver from our emotional expression (Barasch, 2020; Jeong & Frazier, 2008).

<div align="center">

<u>Emotions in Science Education Research</u>

</div>

Emotions are a crucial component of teaching and learning science, not to mention the disciplinary field of science as a whole (Jaber et al., 2021; Jaber & Hammer, 2016; Zembylas, 2016). Beyond that it is impactful in teachers' pedagogical decision making (Zembylas, 2004). Teaching is inseparable from emotion so vulnerability, as an experience connected to emotion, must also be an inherent component of the profession (Bullough, 2005; Hargreaves, 2001). Yet when emotion, affect, or vulnerability have been addressed, the dualistic concept that science and emotion are separate has been foundational (Alsop, 2005; Hufnagel, 2019). Research on emotion has also been constrained by individualistic conceptualization rather than more relational frameworks (Boiger & Mesquita, 2012; Hufnagel, 2019; Zembylas, 2011).

Vulnerability in Education Research

One of the primary barriers on this topic is that there remains no established definition of vulnerability in education research, despite a smattering of attempts to address the concept (Bruk et al., 2018). This has impacted efforts to explore vulnerability and capitalize on its role in teaching and learning. Those which touch on the concept at all either a) do not explicitly define their conceptualization, b) do not explain methodological considerations they've used to identify vulnerability in the data or c) both.

Existing studies of vulnerability in educational settings have been primarily focused on teachers' personal narratives during educational reform (Kelchtermans, 2005; Lasky, 2005). The roots of the existing work on vulnerability in education research are often found in research on

teachers' professional risk-taking experiences. This foundation has led to existing conceptions of

vulnerability incorporating intentionality (Bruk et al., 2018; Gallo-Fox, 2010). While

intentionality may play a role in the cause of expressions of vulnerability, that remains an

unresolved assumption (Bruk et al., 2018). The roots of conceptualizations of vulnerability in

education research are in risk taking (Bullough, 2005; Gallo-Fox, 2010; Lasky, 2005; Uitto et al.,

2016). The basis in risk taking fosters a scarcity model in applications of the concept of

vulnerability. Some work done on vulnerability does not explicitly define the concept as it's

being studied (Kelly, 2013; Uitto et al., 2016). Furthermore, research which does define it does

not detail the methods by which it was identified in the data (Kelchtermans, 2005, 2009, 2011).

Lastly, the majority of research which seeks to address vulnerability does so from a scarcity

framework in which it is treated as unavoidable, but to be mitigated (Bullough, 2005;

Kelchtermans, 2005; Lasky, 2005).

Experiences and expressions of vulnerability are inseparable from and consequential for

the work of teachers (Kelchtermans, 2011). Despite some scholars recognizing the significance

of the concept, education research has made scant effort toward a comprehensive understanding

of vulnerability (Uitto et al., 2016). Kelchtermans (2009, 2011) has rooted his framework for

vulnerability in teachers' self-understanding. Kelchtermans has used a personal interpretive

framework in order to deepen understanding of teachers' self-conceptions and their knowledge

and beliefs about teaching as a system (Kelchtermans, 1996, 2005, 2009). He determined three

primary sources of teacher vulnerability from their personal biographies: educational

administration/policy, professional relationships in the school, and limits to teachers' efficacy

(Kelchtermans, 2011). This conceptualization also centers the political aspects of identity,

considering it to inform and be informed by the sociocultural construction of school

micropolitics (Kelchtermans, 2011). Similarly to many in the education research field however, this orientation contends that vulnerability its effects should be avoided and reduced (Kelchtermans, 2011). His work eventually concludes that "vulnerability is…that which constitutes the very possibility for the "pedagogical" to happen in the interpersonal relationship[s]…[t]he relationship of an ethical and thus vulnerable commitment opens up the chance that education (literally) "takes place"" (Kelchtermans, 2011, p. 81). This begins to bridge to vulnerability conceptualized as something which we should embrace but is not a space that Kelchtermans pursued further in his research.

Another primary context in which researchers have addressed vulnerability is in relation to education and school reform. Differently from Kelchtermans, Lasky (2005) conceptualized vulnerability as "a multidimensional, multifaceted emotional experience that individuals can feel in an array of contexts" (Lasky, 2005, p. 901). Using survey and interview methods, Lasky sought to further understanding of teacher agency, identity, and professional vulnerability (Lasky, 2005). The primary finding regarding vulnerability was that it was inextricably linked to trust in the relationships teachers described during interviewing (Lasky, 2005). Similarly, to Kelchtermans (2005) and Gallo-Fox (2010), Lasky also found a strong link between risk-taking and vulnerability (2005). Lasky asked the teachers specifically about their personal beliefs around professional vulnerability, but all went on to describe the ways in which the political reform they were experiencing in their work affected personal vulnerability, which then informed professional vulnerability (Lasky, 2005). This shared experiences of the teachers resonates with the concept that there is at the very least a deep connection between experiences of vulnerability professionally and personally, or even that they might be one and the same.

Vulnerability is inherently emotional and therefore situated within our individual and collective experiences (Gilson, 2011; Gilson, 2018; Zembylas, 2005a). Current conceptualizations of vulnerability are reductive and focus on inherent risk and posit scarcity. Traditional orientation to vulnerability has positioned it as a condition to be avoided, synonymous with being at risk of harm, whether emotional or physical (Gilson, 2011). Vulnerability may involve risk and powerlessness (Gallo-Fox, 2010), but I do not consider it to be inherent in the experience. Lasky (2005) and Kelchtermans (2005) have done more research on vulnerability than anyone else in the field, but both framed their studies in developing greater understanding of vulnerability to help teachers avoid it in situation where they have expressed powerlessness, such as administrative reform.

A New(er) Philosophy of Vulnerability

Gilson's defines vulnerability as "a basic kind of openness to being affected and affecting in both positive and negative ways, which can take diverse forms in different social situations"(Gilson, 2011, p. 310). Its relational nature informs the fact that it gains meaning and value "in relation to…specific positions, experience, and events."(Gilson, 2018, p. 231). Gilson's definition has four main components. First, vulnerability is a crucial and unavoidable aspect of humanity. Second, it is one of potentiality wherein the openness to something may only be uncovered through interaction. Third, it is highly situated and therefore the gravity of the experience for all involved is determined by an endless variety of norms, expectations, prior experiences, and power dynamics. Fourth, "it is ambivalent and ambiguous in both how it is experienced and its value" (Gilson, 2018, p. 231). Vulnerability is impossible to separate from the experiences and social positions of those expressing it and therefore is highly relational in nature (Gilson, 2018, p. 231). The nature of this conceptualization of vulnerability as highly

interactional and relational makes it salient in discourse. The uncovering through social interaction may be explored through an analysis of the discourse in whatever modality it might take place. Vulnerability is inherently emotional and therefore situated within our individual and collective experiences (Hufnagel & Kelly, 2018; Gilson, 2011). Emotions are *about* something (Hufnagel & Kelly, 2018) and so that *about*ness is present within vulnerability as well.

CHAPTER 3

METHODOLOGY

In this chapter I will first provide the goals of the study and analytical approach used. I will outline the data source and participants, as well as detail the analytical decisions which comprised this study. I conclude by discussing some of the primary groupings within the features of the expressions of vulnerability.

Goals of the Study

This thesis aimed to a) develop ways to identify vulnerability in written discourse and b) examine the expressions of vulnerability in the written discourse.

Conceptualizing Vulnerability

Expressing vulnerability is when we open ourselves to the possibility that we are pushing at the norms and expectations of the space and therefore breaking from the expected outcomes of our sharing. When we share information, opinions, and/or emotions during social interaction it is imbued with discomfort (the vulnerability) for the sharer and the receiver due to expectations related to the social norms of the space, recognizing that those are fluid and evolving. The relational nature of vulnerability is present within it and informs it. Interpersonal relation helps us to understand the social norms of the space and the potential to affect and be affected by the expression of the vulnerability. Emotions often underly vulnerability because of it's positioning within the norms and culture of schools, not to mention society. Spaces of discomfort are avoided and devalued. Emotional sharing is not expected in most professional spaces, making silence a primary tension related to emotions (Hufnagel, 2019).

There are no guarantees of perception when we share in a social space, and we construct security for ourselves by aligning with norms and expectations based on cues from co-participants and by watching the effects of others sharing within the space. In order to examine discursive expressions related to emotion, I had to attend to the experiences, social positioning, norms, and expectations of the participants of the interaction and the space in which the interaction exists. The capacity of a group to express, withstand, and metabolize vulnerability changes and evolves as those features of the interaction change. This change is situated and ambiguous and would need to be continuously revaluated throughout the research process, as well as in any other project.

Vulnerability is natural to human existence and interaction (Butler, 2004; Gilson, 2011). Just as the bounding of vulnerability itself is ambiguous (Gilson, 2011) so is the way in which it is experienced and responded to in social interaction. Vulnerability's framing as opening to risk and harm has contributed to its common conception as embodied. Both the research literature and colloquial use in describing at risk populations, particularly those whose life experiences and behavior increase their chances of bodily harm, rely on vulnerability as a primary terminology and conceptualization. To envision it as so closely related to the body has limited the field's ability to develop the ways in which it is defined emotionally, socially, and philosophically. It is not to suggest that weakness or risk are absent from vulnerability. They may be, but they are not always. The conceptualization used in this thesis makes space for the variety of ways in which vulnerability arises, particularly for educators. It also includes the variety of social contexts which both inform and are informed by its expression. The nature of vulnerability conceptually has presented ongoing challenge amongst researchers in developing a more specific definition, as well as operationalizing it within methodologies.

A Discursive Approach to Vulnerability

There are many components to communication, but language in use is a primary tool of humanity which influences and is influenced by our enacted experience(s) (Gee, 2010). Language extends well beyond the constraints of knowing and is a tool by which we are able to do, be, and say things within our social environments (Gee, 2010). Beyond that, "[e]motions are not private or universal…[they] are constituted through language and refer to a wider social life." (Zembylas, 2011, p. 34). Meaning is not constructed on an individual basis, but within social interaction (Gee & Green, 1998). Language in use gains its meaning in, and is informed by numerous factors including the individuals, place, and culture in which they are being communicated (Gee, 2010). Language is imperative in our ability to communicate, both personally and professionally.

Emotional Expressions in the Discourse

A non-prescriptive approach was used to identify what counted as vulnerability. This open and iterative process was used to highlight all potential expressions (Hufnagel, 2019). This facilitated the "progressive shap[ing]" of the vulnerability (Goodwin, 1994, 1997, p. 122). Informed by Hufnagel and Kelly's (2018) framework for emotional expressions, I attended to three features of the discourse which work together to convey emotion: semantics, contextualization cues, and linguistic features (Hufnagel & Kelly, 2018). These features also make salient the aboutness, or the object, of the emotional expression (Hufnagel & Kelly, 2018). Examining the aboutness was important to identifying what teachers' expressions of vulnerability were about.

Semantics. Semantics encompassed emotion and affect words in this discourse, along with emojis. Emotion words included frustrating, worry, concern, and hope. There were a few ambiguous instances in which the word used was emotional but didn't necessarily indicate the nature of the underlying emotion alone. Examples of this included feel and comfortable. I also included implicit or implied emotion in affective words (e.g. struggle, difficult, worry) as capturing ways in which teachers alluded to their own feelings and also informed the emotional sharing norms of the group.

Contextualization. There are the words we say explicitly and there is implicit meaning behind them, which we develop based on a variety of contextualization cues (Gumperz, 1982). I oriented to punctuation, text size, bolding, and similar style features which impart meaning beyond the words themselves as contextualization cues (Hufnagel & Kelly, 2018). Many of the ways in which we use contextualization don't have to do with specific words at all. Contextualization cues can be a variety of linguistic features which denote information we interpret during an interaction to determine the meaning outside of the words themselves (Gumperz, 1982).

Linguistics. Attending to linguistic features allowed me to highlight additional aspects of the discourse which could be a component of expressions of vulnerability. These included "verb tense, point of view, hedging, amplification, and dampening" (Hufnagel & Kelly, 2018, p. 920). Just as with the other features I attended to, these features did not singularly indicate that an expression was emotional or vulnerable. Rather, they were an additional aspect to attend to in the highlighting process which were compared to other aspects of the analysis to make salient the ways in which they interacted to convey vulnerability.

<u>Research Setting</u>

This study focused on the written discourse of a regional professional learning community (PLC) of middle school science teachers in New England. The professional learning community was hosted by a scientific research institute which maintains a large education department promoting student engagement, teacher support, and citizen science. This PLC focused on a variety of aspects of the teacher experience, but primarily promoted development of scientifically rigorous teaching and improvement of student engagement. The professional learning community met in person at the beginning of the school year for a kickoff event and for a final in-person meeting at the end of the year. These were full day meetings and included workshop and social time for teachers to learn and connect. The monthly meetings during the school year were shorter (1.5 hours) and conducted via Zoom. All meeting dates were listed in the overview of the journals written by the facilitator in order for teachers to set aside the time.

There was a facilitator of the PLC group, Jada. The facilitator ran the meetings and shared group expectations, including participating in reflection journals between Zoom meetings. The 12 teachers in the PLC each had their own document file with the same prompts by the PLC facilitators in the file. Teachers were expected to complete their own reflections in response to the prompts, as well as read and comment on at least one other teacher's entry prior to the start of each month's meeting. The facilitating organization expressed in an overview to teachers that their journals were a tool they used in evaluating the support work they did with teachers. It was also expressed to all teachers in their respective journals that they were a space to engage in connecting with the other teachers in the PLC.

They also co-constructed written reflection journals (the focus of this study). The teachers responded to the monthly prompts in their own document file and then read and commented on each other's, co-constructing a conversation within the community.

Norms and Expectations of the PLC

This study did not systematically address norms and expectations of the group in the PLC using systematic methods. A portion of my understanding of the norms and expectations of the group were drawn from my own experiences in PLCs and working in New England public schools. These experiences left me with the perspective that space is not often made for teachers to express emotion and vulnerability about their professional experiences, which informed the development of the study as a whole, as well as my understanding of these norms. Additionally, I noticed that over the course of the school year, the teachers contributed less to comments on each other's journals. Furthermore, across all the journals it was most common to respond to emotion or vulnerability with silence or an invulnerable comment such as suggesting a resource. While not systematically addressed, it was clear that overall contributions based on pedagogical and content based aspects of their practice were more common and also generated greater interpersonal communication within the journals than expressions of vulnerability.

Participants

The PLC was composed of 12 middle school science teachers and 1 facilitator during the 2018-2019 school year. The teachers were all from different schools and ranged in years in service. A primary goal of the PLC was to connect middle school science teachers in rural areas where they might not have other science teachers to collaborate with in their schools. They were

from various regions within New England. Their professional connection to each other was through the PLC itself, although some were in the same district.

<div align="center">**<u>Data Source</u>**</div>

The data source for this study were the online reflection journals of 12 teachers from school year 2018-2019. These journals were cloud-based document files which allowed commenting by other users. The journals contained monthly prompts corresponding with the 9 months of the school year. The prompts were written in the documents by the PLC facilitator. The entire set of data included over 108 pages of journal reflections.

The written reflection journals had monthly prompts but were semi structured in that teachers had the explicit freedom to address topics or issues by which they felt compelled and outside of the suggested timeline. This norm contributed to the co-construction of documents in which teachers addressed a wide range of topics including professional collaboration, classroom management, and the challenges of teaching inquiry.

The theme of authentic investigation was put forward by the facilitators of the PLC. The facilitators of the PLC oriented the group to the common language of authentic investigation theme during a kickoff event and that common vernacular remained present throughout the school year's journal reflection work. Within the theme were related ideas, such as: communicating findings with an authentic audience, peer review and revision, developing investigable questions, data interpretation and analysis, and investigating real-world problems. Many teachers used the journals as an opportunity to connect with each other, exchange information, and ask for help.

Analytical Decisions

The reflection journals were first printed, then anonymized by hand. I used a highlighting process (Goodwin, 1994). Highlighting is underpinned by the concept that when a feature may be ambiguous or otherwise challenging to determine, a coding scheme can also be too definitive to encompass the uncertainty of the feature in early stages of analysis (Goodwin, 1994). Highlighting provided a method by which to extract relevant expressions from backgrounding in the discourse, while also capturing the situated and "progressive shap[ing]" of the vulnerability (Goodwin, 1994, 1997, p. 122). This highlighting process, while done first, was iterative, as I sought to identify what counted as vulnerability in the discourse of the PLC journals. As such, I used the conceptualization of vulnerability to inform what I highlighted, refining my criteria for the expressions of vulnerability as I applied Hufnagel and Kelly's (2018) methodological approach to examining emotions.

All possible expressions of vulnerability were highlighted (Goodwin, 1994) in the journals. The reflection journals were first highlighted by hand on physical copies. All answers to the journal prompts which contained answers aligning with the broader conceptual framework of vulnerability were isolated, attending to the components of the emotional expressions framework. There were several cases in which the answers teachers wrote in response to the given prompts contained multiple expressions of vulnerability. These were separated from each other and analyzed as separate expressions of vulnerability.

This iterative process worked to identify potential indicators of written expressions of vulnerability. It is not any one individual feature alone which conveys vulnerability, but many features which work together to qualify an expression as vulnerable. Some expressions had only one word or set of words which was categorized as a feature indicating vulnerability, while some

had several. The categories naming discursive features of expressions of vulnerability were not mutually exclusive. There are overlaps in the categories and they worked together to describe ways in which vulnerability was expressed in the written discourse of the PLC. Having a greater number of words categorized as indicators in a given expression was not associated with more vulnerability or more emotion. Additionally, expressing vulnerability is not the only thing which a combination of discursive features might convey, but in this case was the focus of the analysis.

One of the initial challenges in this project was that there was no existing methodological framework for the examination of vulnerability in discourse, not to mention the general ambiguity in the field regarding the concept (Bruk et al., 2018; Uitto et al., 2016). This led me to use an existing framework for examining emotional expressions (Hufnagel & Kelly, 2018) along with my orientation to the concept of vulnerability (Gilson, 2013) to make salient the object and features of expressions of vulnerability.

Features of the Expressions of Vulnerability

The three primary groupings I attended to in the discourse were semantics, contextualization cues, and linguistic features, as detailed above (Hufnagel & Kelly, 2018). Through multiple passes, I used these three groupings to identify specific features of expressions of vulnerability. The patterns and groupings were continually informed by both the framework for examining emotional expressions (Hufnagel & Kelly, 2018), as well as my conceptualization of vulnerability informed by Gilson (2011, 2013). The discursive features were then grouped by their function in expressions of vulnerability. These groups included: affective signals,

amplification, minimization, and point of view. This process is broadly outlined in Figure 3.1 below.
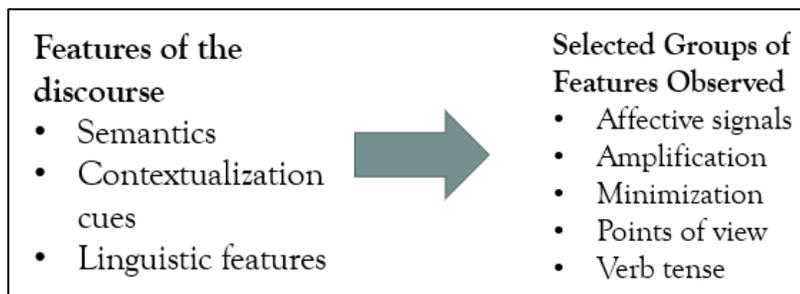
Figure 3.1 Transference of Hufnagel & Kelly's (2018) framework

While the original highlighting process was guided by Hufnagel & Kelly's (2018) methodology, iterations of the analysis (Hufnagel, 2019) of linguistics was still informed by that framework but was used flexibly to fit the data. Because discourse is situated and as such examining for vulnerability is contextual, any framework to examine emotions is not prescriptive (Hufnagel & Kelly, 2018). This was not to reduce or eliminate any of the groupings outlined by that method but to include them and make space for others which might arise from the analysis. As might be expected, each expression in the dataset contained more than one linguistic feature.

Through multiple readings of the data, I noticed patterned features of the expressions that overlapped with some which were part of Hufnagel & Kelly's (2018) methodological considerations for examining emotional expressions. However, they were also unique in comparison to the trends discussed in that work. These features were then grouped into broad categories before several more passes to further refine the examination of the features and their groupings. These initial groupings included: amplification, hedging, contextualization cues, emotion words, point of view, verb tense, and a large ambiguous grouping of phrases and words which didn't become salient until later passes (see Figure 3.1 above for an overview of the transition).

Below is an example from the data with an explanation of some of the ways it was addressed linguistically:

> Although *I* have been **struggling** on where to start and have the students investigating at the same time. *They* are also all on their own investigations for the science fair in March. So *I* <u>want to be able to balance it all</u>. (Zoe)

Zoe's first sentence uses *first person singular* in reference to herself and the challenges she's facing regarding student investigations, but then switches her students' point of view in her second sentence starting with *they* and back again to *first person* in the last sentence. This alternation between point of view embodies the balance she describes in the passage as she switches back and forth between herself and her students. She also expresses that finding the balance has been a **struggle** for her, a semantic feature expressing implicit emotion. She goes on to say she "<u>want[s] to be able to balance it all</u>". This phrase expresses that Zoe desires to meet her investigation goal, but that there is an element of doubt as to whether it can be done or not under the circumstances she discussed in the expression. These linguistic features work together along with and contribute to the subject of the expression, conveying her challenge and desired outcome related to her instructional goal with the PLC and praxis as a whole.

Alternatively, Maya doesn't center herself at all and instead focuses on her students.

> But, <u>getting</u> *4 classes* <u>to come up with</u> a project that will work is a bit **daunting**. (Maya)

There are notably no pronouns in the sentence. Maya instead refers to "*4 classes*". She does express that the getting them to come up with the project is **daunting**, but does not specifically say that she is daunted, though that is implied. The underlined portion of the sentence in which she explains that she needs to "<u>get</u>" the classes "<u>to come up with a project</u>" emphasizes her

students' responsibility in the investigation process, rather than the teaching role she is in. She does not specify what she means by a project working, which could be anything from having the appropriate resources to conduct it to the viability of the idea itself. Maya's statement is overall more ambiguous than Zoe's but contains linguistic features which contribute to conveying the aboutness and implicit emotion.

Grouping Features by Function

Once the linguistic categories were finalized, they were copied into a new spreadsheet and iteratively organized by their function. This entailed comparing the categories back to the original expressions and grouping them by the way in which they contributed to the conveyance of vulnerability. For example, question marks did not always function the same way. They were sometime used to make a suggestion

Maybe we should consider posting the newest blournal post first rather than scrolling down? (Caroline)

and sometimes in asking for help

Any unique management strategies that you've tried and have been successful? (Anna).

When there were multiple question marks used together, they conveyed a sense of urgency about time constraints

We have two weeks to be out of the woods because of hunting season. So all images/documentation need to be done by then but the we can finish up in the classroom after that?????? (Ella)

or ethical concerns about investigation practices

6th grade has shown the invasive project is worthwhile - next year we need to do some

sort of research to see if we should try to eradicate the invasives out back or do we get

more out of leaving them for the learning experience?????? (Ella)

The fact that both expressions above were made by the same teacher also brings to the fore the

highly personal nature expressions of vulnerability and their features, discussed further in

Chapter 5.

Some of the groups of functions included amplification, minimization, relaying emotion,

and expressing need. Attending to the functions of each individual instance in which the

linguistic feature was present brought forward the myriad of ways each feature can be used to

contribute to conveying vulnerability.

Grouping Similar Emotions

When using contextualization cues from other aspects of the expression, it was possible

to ascertain the tone of the emotion as positive or negative, but the emotion word alone did not

do so. The presence of emotion words or implicit emotion was not solely responsible for the

expression being highlighted as one of vulnerability but worked in conjunction with other

features of the discourse to convey vulnerability. Some words considered to be expressing

negative emotion or affect included difficult, hardest, frustrating, and daunting. Some words

considered positive were wonder and hope. The positive-negative binary regarding emotion and

affect has its critiques (Hufnagel, 2019; Shiota et al., 2021), but recognizing and labeling an

emotion is a categorization in and of itself (Barrett, 2006). The only positive emotion words in

the data set were wonder and hope. The negative emotion words included worry, sorry, concern,

and terribly. Not all words considered emotional were explicitly emotional. Emotion was relayed

in both explicit and implicit ways. Explicit emotion included hope, worry, and sorry. Implicit

emotion included weakest, challenge, daunting, and struggle. These words do not specifically refer to an emotion but are informed by it and sometimes serve as placeholders for more explicit emotional expression.

Grouping Amplifiers

All terms which served as amplifiers were then copied into a new spreadsheet and further analyzed for what part of the expression they were amplifying. Many expressions of vulnerability contained more than one amplifier, and each was separately coded. Each amplifying feature was also assessed individually to determine what aspect of the expression it amplified. Amplifiers were highly situated within the individual expressions and served to amplify a wide variety of aspects of expressions of vulnerability. The parts of expressions being amplified became new categories to examine what teachers most often amplified in expressions of vulnerability. These categories included time constraints, wanting more student engagement, and requests for help. There was notably only one instance of amplifying an emotion word in the data.

Aboutness

The object of an emotional expression, or the aboutness, have a specificity which makes salient the aspects of teachers practice about which they were writing (Hufnagel, 2019; Hufnagel & Kelly, 2018). In order to examine the aboutness of the expressions, they were all typed into a spreadsheet and analyzed using an open, iterative coding process. Through the first read, each expression was coded to an aboutness category I developed utilizing teachers own words. This was refined through multiple passes to ensure the categories were sufficiently specific, descriptive, and appropriately represented the teachers' statements. All aspects of the reflection journals were considered potentially relevant to contextualizing the aboutness of teachers'

expressions including the prompts, written answers, and comments from colleagues. Examples of specific aboutness categories include: teacher apologizing for not completing journal entry, teacher challenged in supporting students to develop own investigable questions, and asking other members of PLC for management strategies. Each expression of vulnerability had one or more aboutness. These categories were not mutually exclusive and each expression of vulnerability could have had multiple subjects, in fact many did.

Grouping Aboutness Categories. Once all expressions had at least one specific and representative aboutness, these categories were copied into a new sheet and grouped thematically. The subgroups and their overarching themes in entirety are below.
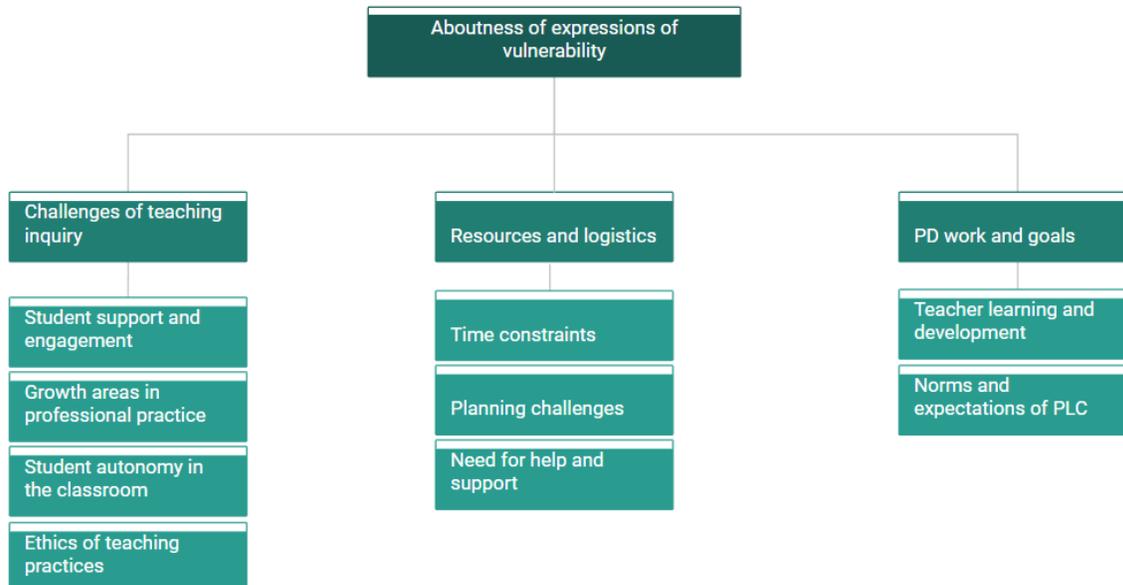
Figure 3.2. Aboutness categories

Grouping helped to establish patterns and themes across the dataset but was limited in how it captured the way in which these groupings overlapped. The figure below offers a more representative image of aboutness categories. Aboutnesses of the expressions were captured even if at the border or in overlap with other categories. If more than one aboutness was present in the expression, all were captured individually in the analytical process.

CHAPTER 4

FINDINGS

This chapter will present the various findings of this thesis in greater detail. First, features

of the discourse which contributed to the conveyance of vulnerability will be discussed. Then,

the patterns across groupings of aboutness of the expressions of vulnerability will be detailed.

This includes primary groupings and examples of them from the data. I conclude with findings

related to the ways in which these two aspects of the expressions interacted and contributed to

conveying vulnerability in the written discourse.

Features of the Expressions of Vulnerability

Throughout the expressions of vulnerability there were two prominent features: affect

and amplification. In the set of 102 vulnerability expressions, there were 69 and 67 instances of

these features, respectively. For the sake of reference, the third highest used feature of discourse

that relayed vulnerability was 33 (expressing need). In this section I describe the affective and

amplifying features of the vulnerability expressions.

Affective Signals

A primary feature of expressions of vulnerability in the written discourse was the

presence of affective signals. There were 69 total instances of affective words within the

expressions of vulnerability. These words were grouped in a variety of ways to make salient

prominent patterns about "positive" and "negative" emotions and explicit and implicit ways they

were conveyed. Affective words, in comparison to emotions, are broader including terrible,

weak, struggle, and daunting. Affective words were included and grouped with emotion due to

the highly personal nature of emotional expression in the discourse. Attending to both the

explicit and implicit ways in which teachers expressed their emotions related to vulnerability made salient the wide variety in ways in which they did so. This allowed for expressions to be captured no matter the individual's ability to relay emotion (Barrett, 2006).

Positive and Negative Affective Signals. Words expressing emotion and affect in teachers' expressions of vulnerability were overwhelmingly related to negative emotion when categorized only as "positive" or "negative" (Table 4.1). This is binary conceptualization is reductive when considering the wide range of human emotions, but this study is constrained by the lack of more inclusive published frameworks for emotional and affective expressions. Staying within the binary construct, positive emotion is related to attaining or achieving personal goals. Negative emotions typically occur because events and ideas inhibit one's personal goals. Considering this conceptualization of negative emotion combined with teachers own words, we can establish that they have goals and they're not being met.

Type	#
"Negative"	62
"Positive"	7

Table 4.1. Number of positive and negative affective words in expressions

The most used words connoting negative emotion were challenge, struggle, and difficult. These words were used to describe teachers' feelings about a wide variety of aspects of their professional practice. These aspects were professional development work and goals, time constraints, lesson/unit planning, student engagement, and the norms and expectations of the PLC. "As always I am challenged to provide ongoing "authentic" experiences and still follow the curriculum" (Charlotte). Here, Charlotte expresses she feels challenged in managing to meet the expectations of incorporating authentic investigation into her classroom while following the curriculum in her school. While the use of "challenged" implies her negative emotion about not

meeting that goal, it also positions the curriculum as opposite to authentic investigation in the classroom. This provides further context as to the challenges teachers face regarding incorporating these investigation practices.

Implicit and Explicit Signals. The majority of the affective words relayed emotion implicitly, rather than explicitly (Table 4.2). Hence, most of the time teachers insinuated their emotional experiences as a part of their vulnerability rather than writing more candidly about them. Words relaying implicit emotion included challenge, struggle, difficult, and help. The use of these words alone did not help to convey the emotion but worked alongside other features of the expression of vulnerability to convey the vulnerability itself and other aspects of affect related to the expression. At one point Caroline said, "Our team has really struggled with Expeditionary Learning". She did not explicitly mention emotion words related to the struggles the team experienced around this reform-based pedagogy, but any interpersonal team struggle is inherently imbued with emotion.

Implicit emotion words and phrases overwhelmingly communicated negative emotion rather than positive (Table 4.3). This is in part because implicit emotion words were more prevalent (Table 4.2), but also related to the ways in which negative emotion was expressed in the discourse. This finding aligns with the conception of negative emotion outlined above in which it arises due to not meeting one's goals.

The emotion being relayed in explicit emotion was closer to an even split between positive and negative (Table 4.3). Explicit **and** positive affect words included hope and "OK". While OK does not necessarily read as positive on its own, the expression was related to the fact that the teacher felt ok about the incorporation of some of their goal investigation themes in their classroom. When using the positive/negative conceptualization explained earlier in this section,

ok was then categorized in the positive affect words. This contrasts with the frequency with which implicit emotion words relayed positive or negative emotion. Overall, negative emotion was more commonly expressed within vulnerability and most commonly this was done implicitly in the written expression.

Type	#
Explicit emotion words	13
Implicit emotion words	56

Table 4.2.Explicit and implicit emotion words

Type	#
Explicit "Negative"	8
Explicit "Positive"	5
Implicit "Negative"	54
Implicit "Positive"	2

Table 4.3. Emotion words explicitly and implicitly

Amplification

The second most common linguistic feature of expressions of vulnerability in this data set were amplifiers. Amplifiers were any linguistic feature which contributed to increasing the impact or importance placed on a word, phrase or other aspect of an expression. As described in Chapter 3, amplifiers were only coded if they amplified the vulnerability itself, not other aspects of the written discourse. Half of all expressions of vulnerability within the data set contained at least one amplifying feature. Here Caroline expresses an issue she having with her students' academic honesty: "Students copying others work this year is a HUGE problem". Her use of capitalization serves to amplify the magnitude of the problem she conveys in her expression.

<u>Prominent Amplifiers: More.</u> There were several amplifying features which were prevalent across the dataset.. The most commonly used amplifier was *more*. This amplifier was used in reference to a variety of situated instances within expressions of vulnerability.

Expressions of vulnerability which contained this amplifier addressed teachers' feelings about their proficiency, supporting their students, engaging their students, and finding sufficient time for instruction. *More* was often used to amplify something the teacher felt needed increase or improvement. For instance, Charlotte shared, "I feel OK about the other themes although I hope to become more proficient over time." Charlotte referred to her hope to become more proficient in the investigation themes. She expressed that she does feel somewhat proficient already, but desired to increase that. *More* assisted her in conveying that, along with the content of the statement. Another example of *more* came from Laura when she wrote, "I know that I should engage my students more often in data analysis." Lauren refers to her students' engagement in data analysis and the obligation she feels to increase it. It works alongside the content of the sentence and the word *often* to convey the aspect of her practice to which she is referring and the effect she feels would improve the practice. In this case, that would be to increase student engagement in data analysis.

Prominent Amplifiers: Exclamations Marks. Exclamation points were also commonly used amplifiers within teachers' expressions of vulnerability. This feature amplified a wide variety of aspects within expressions of vulnerability including teachers comments on progress related to their professional development goals,

"All the themes are present, although vary greatly in quality!" (Charlotte)

expressions of perseverance,

"…But I will not give up!" (Ella)

requests for help,

"…Not sure what else I can do.... (HELP!)" (Caroline)

apologies,

"I was a slacker and did not do entry #2." Sorry! (Anna)

and expressions of challenge.

"This is a challenge for me too!" (Charlotte)

As evidenced above, exclamation points were used in a variety of contexts to convey amplification of the conveyed statement. Expressions of vulnerability containing exclamation points always had them positioned at the end of the sentence.

Caroline's request for help ("Not sure what else I can do.... (HELP!)") was unique as the exclamation point is specifically related to the word *help*. The ellipses prior to the word *help* separate it from the earlier statement "Not sure what else I can do". That statement expresses a sense of helplessness she was experiencing related to her students' performance on assessment (referenced earlier in the journal entry). The ellipses separate the statement of helplessness from the request for help and she then amplifies the request for help with an exclamation point and also capitalization. The presence of two amplifiers for this one word relay an even greater sense of urgency and amplification.

Prominent Amplifiers: Really. Another prominent amplifying feature of the discourse was *really*. Teachers used the word really to amplify aspects of their expressions of vulnerability related to requests for help, suggestions to the PLC, ethical questions in their teaching practice, struggles, and student engagement. *Really* preceded a verb in all but one instance within this dataset. The overwhelming majority of instances in which *really* was used amplified a particular action which the teacher expressed was, wasn't, should, or shouldn't be happening. This was sometimes related to their work outside of the classroom regarding planning and preparation

"Do we really need more plastic dodads out there? Dragon baby candy sculptures/or cakes would leave no trace!" (Ella)

Here Ella questions the ethical implications of contributing to the creation of plastic waste in her classroom. *Really* served to amplify her questioning of the necessity of the task's outcome. The amplification also contributes to the rhetorical nature to the question considering the nature of public understanding related to plastic pollution.

Teachers' use of *really* as an amplifier was also related to the challenges they saw their students facing.

"I began the year wanting to focus on Communicate findings with an authentic audience. However, my group this year in Alt. Ed is really struggling with working together and investing in activities. We have ended up spending a lot of time working on other skills." (Natalie)

Natalie shared that her alternative education students were "really struggling" in their collaboration and engagement. This caused her to rethink the investigation theme she had wanted to focus on from a professional learning perspective. She use really here to amplify the degree to which her students were struggling as a way to justify her choice to focus on areas outside of the investigation theme.

Prominent Amplifiers: Capitalization. Capitalization is unique among this set of amplifiers as it is visual as much as it is a linguistic feature in written discourse. Capitalizing entire words amongst those which aren't creates a visual distinction and also denotes amplification within the statement. Teachers used capitalization to bring attention to their

feelings about their work, students academic work, requests for help, and suggestions for the PLC.

> "NOT SO IMPRESSIVE-worked with the 3D printer to try to create dragon babies for the genetics final assessment - could not get it to work - then kids lost interest - I question what kind of projects could we use the printer for that would really make a difference." (Ella)

Ella started her sentence with the capitalized phrase "NOT SO IMPRESSIVE" making a strong statement regarding her feelings about the remainder of the sentence. She used capitalization to amplify the degree to which the impressiveness of the 3D printer assessment performance fell short. This is a very forthcoming example of a teacher sharing their feelings about their own teaching practice.

Capitalization was also used to relay aspects of teachers' vulnerability regarding their students' academic performance.

> "Students copying others work this year is a HUGE problem." (Caroline)

Caroline used capitalization here to amplify the degree to which students copying was a problem in her classroom. Capitalization was not as prevalent in the data when measured by frequency, but contributed a unique aspect to the expressions of vulnerability due to its' nature as a visual and linguistic cue.

Features in Interaction

Features did not operate on an individual basis. Just as vulnerability and emotions themselves were interactional, so were the features which served to convey them.

Linguistic Feature Interaction. These were often in combination other linguistic features working together to convey and add dimension to the vulnerability. A common example in the data set showing this combination of features is the phrase "most difficult". *Most* is a word which was coded as an amplifier, but *difficult*, was coded as a word relaying emotion (implicitly, see emotion words section). They individually contributed to the larger expression of vulnerability. *Most* (the amplifier) also contributed specifically to *difficult* and conveys an amplified sense of difficulty. Beyond that, the phrase could then be situated in a variety of expressions taking on very different meanings.

Amplifying Within Aboutness. Broadly within this data, this set of linguistic features tended to amplify aspects of the subject, or aboutness, of the expressions of vulnerability. The largest categories of aboutness which contained amplifying features were adequate student support and engagement, and time constraints. Each expression of vulnerability had at least one, but often more than one aboutness. Therefore, the aspect of the expression being amplified does not necessarily align with the most common aboutnesses across the entire data set. The aboutnesses most often amplified within the expressions of vulnerability were teachers' professional development work and goals, and resource constraints.

Amplifying Teacher Learning and Development. Teachers often amplified aspects of their expressions of vulnerability which were about their professional learning and development related to the PLC. This was often probed explicitly by the PLC. For example, teachers were asked which investigation theme they found challenging.

> "I think the most difficult for me is giving them the time and freedom to engage in peer review and revision." (Maya)

Maya's statement here is about the two aspects of teaching that she finds challenging in achieving this investigation theme. However, it is not the "time and freedom" amplified, but the word "difficult". Maya amplifies how she feels about that theme in the first half of the sentence, not the constraint that she feels prevents her from achieving it. Maya was not the only teacher who expressed amplified statements about their professional learning.

"All the themes are present, although vary greatly in quality!" (Charlotte)

Charlotte does not express that any of the investigation themes are a challenge to her, but that they are not of the same quality. She amplifies that variance in quality with her use of "greatly". This variance in quality, contextualized within her statement about the investigation themes, is amplified and connected to the subject of this clause within the expression.

Amplifying Time Constraints. There were also a set of expressions within which the subject amplified was related to teachers time constraints. "It is challenging keeping the momentum going with so many snow days." (Lauren)**.** When Lauren expresses that there have been "many snow days" this amplification takes its meaning not in relation to the noun it precedes but contextualized by the constraint it implies. "So many snow days" matters because it has created the challenge of maintaining momentum in the classroom, as she states.

Aboutness of the Expressions of Vulnerability

There were three primary groups of *aboutness* across the expressions of vulnerability (Figure 3.2). The following table illustrates the prevalence of each aboutness was found in the dataset. Assignment of aboutness categories were not mutually exclusive and many of teachers' expressions had more than one aboutness category, or object of the expression of vulnerability.

Challenges of Teaching Inquiry	
Student support and engagement	23%
Growth areas in professional practice	16%
Student autonomy in the classroom	10%
Ethics of teaching practice	2%
Total	5%
Resources and Logistics	
Time constraints	15%
Need for help and support	7%
Planning challenges	4%
Total	27%
Professional development work and goals	
Teacher learning and development	14%
Norms and expectations of PLC	8%
Total	22%

Table 4.4. Percentages of aboutness categories

Challenges Related to Teaching Inquiry in the Classroom

The largest group of aboutness categories encompassed teachers' statements about

challenges of teaching inquiry in the classroom. This group made up 51% of all aboutness

categories in expressions vulnerability across the data set (Table 4.4).

Student Support and Engagement. The most prominent subgroup in *challenges* was

student support and engagement. This subgroup made up 23% of all instances of aboutness in

the expressions of vulnerability (Table 4.4). Teachers made it clear in their vulnerability

expressions that students being well supported and staying engaged in lessons was both

important to them and often an aspect of their practice upon which they wished to improve.

I know that I should engage my students more often in data analysis. (Lauren)

Here, Lauren expressed that she felt her students hadn't been engaged enough in data analysis.

She positioned herself at the forefront of responsibility to support them in improving their

engagement in that space. She did so by speaking from the first person and expressing that she "should engage [them] more" rather than positioning her students as needing to increase their engagement independently.

> This year my students have struggled with this. I am getting scribbles. No color, even
>
> when I hand out colored pencils. Can you share some of the lessons you did around this?
>
> (Natalie)

Natalie wrote that her students were challenged in completing adequate scientific drawings as a part of their investigations. Unlike Lauren above, Natalie positioned her students challenge at the forefront of the expression. She reached out to her fellow PLC members for lessons others had done before which might help her to support her students in improving their drawings. Each of these teachers (Lauren and Natalie) used different vantage points and experiences in teaching to express the ways in which they were concerned about and seeking to support their students' investigation skills and engagement.

Growth Areas in Professional Practice. Within the expressions of vulnerability about teaching inquiry, teachers also identified aspects in which they felt inquiry was absent from or a growth areas in their professional practice. These expressions made up 16% of all aboutness in expressions of vulnerability (Table 4.4). Teachers' expressions of vulnerability regarding growth areas in their practice were exclusively about the investigation themes of the PLC.

> All the themes are present to some degree; sharing work with an authentic audience,
>
> following up on student generated questions, and adequate data analysis happen less than
>
> the others (Lauren)

Rather than framing her thoughts on the investigation themes as challenging, Lauren expresses that they "happen less". She indicates that those aspects of science teaching aren't a part of her practice for an ambiguous reason and doesn't directly relate it to challenge. Lauren is also ambiguous about her connection to both her practice and these themes presence in her practice. She does not specifically refer to herself, her practice, or her students in this statement.

> I think most of them are in my practice to some extent or another but not necessarily being done or explained well by me (Olivia)

Olivia didn't claim that any of the investigation themes are challenging either but differs from Lauren in that she is reflexive about their presence in her practice. When she used "by me" she circles the statement back to herself and her role as the one who could or should incorporate those themes into her teaching. Olivia and Lauren show that teachers expressed varied degrees of personal connection in expressions related to growth areas or things they claimed not to be doing in their professional practice.

Student Autonomy in the Classroom. Teachers' expressions of vulnerability regarding their students' autonomy were a small, but diverse subgroup. The investigation themes of the PLC were prevalent in this subgroup, similarly to *growth areas in professional practice*. While this subgroup has similarities to *growth areas*, it is characterized by teachers' expressions regarding the resulting student experiences if they were able to better embrace students' academic autonomy in the classroom. The similarities and distinctions of these two subgroups are an example of the interconnectedness between aspects of teachers' expressions of vulnerability. This was an overarching theme throughout several aspects of the analysis.

Teachers expressed their feelings regarding their students' academic autonomy in a variety of ways. Some wrote that it was a challenge for them, such as when Anna wrote,

I have trouble handing off the control to students in terms of asking questions.

Anna's statement centered her role as a mediator of her students' autonomy by using first person point of view in the expression. She also expresses that the challenge related to student autonomy is related to her relinquishing it rather than her student's willingness or capabilities in exercising it. Others expressed that student autonomy was something they wanted to try and improve on. Natalie expressed this sentiment when she shared, I have not let students do research before this process, however, I think I am going to try this next time.

Natalie positioned herself as the primary barrier between her students and their independent engagement with a research process. She did not indicate here that she is concerned with their skills and abilities as a preventative factor. She also expressed that she is going to try to let them conduct research in the future; indicating her desire to engage in growing her professional practice.

Similarly, other teachers who wrote about their students' autonomy were open about the degree to which they controlled student work, as seen Caroline's reflection below,

I still need to work on collecting data, analyzing data, and drawing conclusions in a meaningful and productive way- as allowing students to take more ownership of this part rather than being dictated by me.

She outlined the three themes in which she felt she needed to improve upon. Caroline admits to dictating these aspects of investigation in her classroom rather than allowing her students greater

independence. She contrasted this with her concept of what it means to be "meaningful and productive" in these spaces within her practice and her students learning.

    Ethics. The fourth challenges subgroup was vulnerability related to ethics. There were three uncommon and notable instances in which one teacher (Ella) wrote about ethical questioning she had regarding her classroom practice. Her writing did not elicit any responses within the discourse by others in the PLC. The types of questions Ella asked were not prevalent across the data set but that contributes to their significance. While others weren't talking about or responding to these topics, Ella continued to write on them throughout the school year. This is even more significant when we consider that the content of the questioning pushed on tenets of current conceptualizations of strong STEM teaching.

> NOT SO IMPRESSIVE-worked with the 3D printer to try to create dragon babies for the genetics final assessment - could not get it to work - then kids lost interest - I question what kind of projects could we use the printer for that would really make a difference. I question if we should be making plastic dragon babies - Do we really need more plastic dodads out there?

Ella set the tone immediately with this statement informing the reader that what is to follow is "not so impressive"; amplified by the fact that she wrote the phrase in capitalization. She went on to share "could not get it to work", notably missing a pronoun at the beginning of the statement. It was implied that she was the one who was not able to get the 3D printer to work in this case but does not say so explicitly. The way she wrote about this process was a physical representation as she used em dashes to connect each subsequent event in the assessment she describes. She then drew a line (literally and figuratively) to the implications for future use of the tool in the classroom. Questioning technology, which is both embedded and valued in

contemporary STEM teaching practices, shows that Ella was willing to display aspects of her practice which were likely not to align with her colleagues. Later in the school year she wrote:

> 6th grade has shown the invasive project is worthwhile - next year we need to do some sort of research to see if we should try to eradicate the invasives out back or do we get more out of leaving them for the learning experience??????

Contrasting to her statement above, Ella leads this statement with a positive and confident statement. Invasive species are a popular environmental issue, and she wrote that the project her class had done on them went well. She shifted to then questioning whether it is responsible to leave invasive species since they are academically productive for the students to work with. Ella uses several question marks at the end which serve to amplify the conflict she feels about this ethical quandary. Ella showed again with this statement that she was willing to write about aspects of the practice not touched on by her colleagues, including those related to ethical choices which might prove contentious.

Resources and Logistics

Resources and logistics was another major grouping about which teachers expressed vulnerability. It made up 27% of all aboutness categories in expressions of vulnerability. This group was differentiated from other challenges of teaching inquiry as it was related to aspects of teaching practice outside of teaching lessons such as planning, support staff, snow days, and other administrative tasks that are a part of the profession. They are undoubtedly related to and influence teaching in the classroom but are important to address as their own grouping. These challenges included growth areas in practice but identified a particular barrier in teachers work that extended beyond the classroom. It is important to note that these expressions could have

been related to other groupings as this coding process captured multiple aboutnesses if they were present within the expression.

Time Constraints. *Time constraints*, a subgroup of *resources and logistics*, comprised 16% of all aboutness categories in the expressions of vulnerability. Teachers wrote about feeling hurried or that they were running out of time. They expressed that this affected general instruction as well as working on the investigation themes of the PLC.

> Engaging in peer review and revision can be a challenge not the act but the time needed to do so. (Olivia)

Olivia differentiates that her challenge with peer review and revision was not related to a pedagogical or content challenge, but directly related to the constraint of the time available to her. Within the expressions about time constraints, snow days were a common theme. Teachers expressed they lost momentum and overall time due to the days off.

> It is challenging keeping the momentum going with so many snow days. (Lauren)

> Snow days! We have had six snow days and holiday vacations and it's been difficult to plan and carry out investigations. (Nina)

The other primary concern regarding time were the administrative tasks outside of teaching with prevented teachers from working on lessons or other aspects of pedagogy.

> I have been out a number of days and there have been many administrative things that took priority and impinged on science time. (Sam)

Sam was ambiguous about what other administrative tasks were taking up her time but was candid about the fact that she was prioritizing them in her work. Not only is it uncommon for

teachers to express that they do not prioritize their teaching, but also this PLC was focused on teachers' improvement related to their teaching practices. Despite this, there are many aspects of the teaching profession outside of the act of teaching which affect teachers work. Teachers' expressions of vulnerability reflected the role of those responsibilities in their professional life.

Help and support. Expressions of vulnerability in which teachers asked for *help and support* composed roughly 7% of all aboutness categories. Teachers asked for help and support in a variety of areas including classroom management, collaboration, and scaffolding lessons. Expressions relating to help and support were insular to the PLC and did not refer to help and support from teachers' individual school communities. Similarly, to other subgroups, these expressions had content overlap with other aboutness categories and were represented within those as well. As the categories were not mutually exclusive, many of the expressions in which teachers wrote about help and supports contained other subjects

> I really need help scaffolding this theme…I want to try to use the same methods that I used for creating the "Do Now" learning- repetition and built -on learning, structured, challenging, but also some review so they can feel success. (Caroline)

Caroline shared she wanted to scaffold the use of the investigation themes had to do with supporting her students' self-efficacy while she pushed forward investigation themes in her praxis. She expressed in her writing that she "really need[ed] help" on this, signaling to any of the members reading her journal that she was looking for suggestions and support on this even if it wasn't a direct question. "Hi Ella, These are two of my weakest areas. Maybe we can work together to get some of this done." (Olivia). Olivia also avoided using a direct ask for support, similarly to Caroline. Ella had written in her journal that engaging in peer review and revision and communicating findings with an authentic audience were both absent from her practice.

Olivia responded to that statement using the comment feature, sharing the above. She confirms to Ella that those themes are also weaknesses for her and suggests that supporting each other could help to "get…this done". Ella also responded to the suggestion saying that she would like to do so. Each of these excerpts from teachers' expressions of vulnerability show the ways in which teachers avoided direct questions and instead relied on other words and phrasing to express their need for help and support.

Professional Development Work and Goals

Professional development work and goals composed 22% of categories of aboutness in expressions of vulnerability across the dataset. This group encompasses aboutnesses related to teachers learning and development as a part of the PLC. This included teachers writing on the goal setting and development work they were doing related directly to the PLC. Expressions of vulnerability were also about the norms and expectations of the PLC itself including suggestions and admissions of not finishing the monthly reflection work. Many of the expressions in this group related to teachers' goal setting, learning, and development work in the PLC. Approximately one third of the expressions within this group were about the norms and expectations of the PLC itself.

<u>Teacher Learning and Development.</u> Teachers' expressions of vulnerability touched on their goals related to the work they were doing in their PLC. While these goals were touched on in relation to other aspects of aboutness, this category makes salient the aspects of their professional development goals they typically expressed vulnerability about. Teachers expressed a sense of pressure to meet the goals they had set for themselves. "Get my act together and get it done." (Sam). They also wrote about the goals were challenging, but they wanted to continue to work on them. "I'm in my second year focusing on this goal. I've made some growth but look

forward to making more progress this year!" (Charlotte). However, one expressed they did not feel ready to address those goals. "I know I should work on the themes I've identified as hard or not present, but right now I just don't feel ready to commit to that." (Anna)*.* Each teacher did their own goal setting within the PLC so the ways in which that aspect of their work was made salient in teachers' expressions of vulnerability were highly varied.

Norms and Expectations of the PLC. A portion of teachers expressions of vulnerability were about the structure and function of the PLC itself. This small subgroup composed about one third of the group *professional development work and goals.* There were two categories into which these expressions fell: PLC tasks and PLC suggestions. Teachers' expressions of vulnerability touched on times when they did not complete their work for the PLC. For example: "I was a slacker and did not do entry #2. Sorry!" (Anna)

One teacher also made suggestions to each other and regarding the structure of the PLC work.

> "Simple tweeks like changing the font so I can see what is a question and what is a response or work on the spacing so that responses are right after the questions would be really helpful. Maybe we should consider posting the newest blournal post first rather than scrolling down?" (Caroline)

This category of aboutness was notably composed by expressions of vulnerability of two teachers. This category is also interesting because there were no specific prompts within the reflection journals which probed the activities of the PLC and its structure, whether implicitly or explicitly.

The two teachers whose writing contained aspects about this subgroup did so of their own volition rather than by suggestion or direction. This differs from all other aboutness categories which are related, at least implicitly, to prompts or other teachers' comments within the journals.

CHAPTER 5

DISCUSSION AND CONCLUSION

Middle school science teachers' written reflections showed that expressions of vulnerability were characterized by both their discursive features and aboutness. The most prominent features of expressions of vulnerability were found to be affective signals and amplification. Affective signals were overwhelmingly related to negative emotion and affect. Amplifying features served to contribute to increasing the impact or importance placed on an aspect of the expression. In this case amplifying features were prominent in expressions of vulnerability and contributed to increasing the impact and importance placed on the vulnerability. Previously, vulnerability has been studied using teachers' personal narratives (Kelchtermans, 1996, 2005), survey and interview data (Lasky, 2005), as well as weekly prompts in which they wrote about their experiences as mentors of pre-service teachers (Bullough, 2005). None of these studies explicated their qualitative methods in a level of detail which would allow for further study in similar formats and methods. Those who did touch on it mentioned the development of prominent themes or sources of vulnerability they found broadly across the data (Kelchtermans, 1996; Bullough, 2005). This thesis contributed to clarifying methods by which expressions of vulnerability in written discourse may be examined by systematically utilizing an existing framework for examining emotional expressions (Hufnagel & Kelly, 2018), as well as a conceptualization of vulnerability informed by Gilson (2011, 2013, 2018). This elucidated prominent discursive features of expressions of vulnerability, contributing to the further development of methodological approaches in this field. However, this is still a developing field of study and rigorous methodological studies are important to continue the growth.

Vulnerability was expressed about a variety of aspects of teachers' experiences and practices. These *aboutnesses* were grouped as challenges of teaching inquiry, resources and logistics, and professional development work. Expressions of vulnerability were predominantly about challenges related to teaching inquiry. A significant portion of this was related to supporting their students and student engagement. The range of aspects about which teachers expressed vulnerability indicated how pervasive the experience was for them. It spanned aspects of their classroom teaching, professional learning, and myriad of other tasks related to the profession. Overall, the expressions were highly personal, situated, and relational. There were aspects of the vulnerability that each component cannot convey, but together they operated to contextualize vulnerability. Broadly, these expressions made it clear that teachers' have deeply personal and influential feelings about all aspects of their work, especially regarding their role in supporting and guiding their students.

As there has been limited attention to vulnerability specifically, previous study of emotion and affect were also considered in understanding the field of research for the purposes of this thesis. Those who have examined the role of emotions in teaching and professional decision making had established its importance and impact as a prominent driver in teachers' professional experiences (Jaber et al., 2021; Jaber & Hammer, 2016; Vedder-Weiss, Hufnagel, Jaber, Finkelstein, Dini, McGugan, Garner, Horn, Maslaton, & Lefstein, 2020; Zembylas, 2016). Teachers' vulnerability has been previously found to be related to their affective experiences regarding school reform (Lasky, 2005; Kelchtermans, 1996), which was not a finding in this study. This thesis research found that vulnerability largely focused on challenges in teaching related to students' experiences, which was also distinct from previous studies (Kelchtermans, 2005, 2009; Lasky, 2005). Teachers' identification of areas in their professional practice in

which they need to grow and improve aligned with previous studies (Bullough, 2005; Uitto et al., 2016). Furthermore, vulnerability has also been found to be consequential and important in deepening understanding of teachers' knowledge and beliefs about their work (Lasky, 2005; Uitto et al., 2016; Bullough, 2005). Ultimately, there were both divergences and similarities with extant research, though the comparable studies are limited and therefore so are the threads which can be drawn between them.

This thesis did not seek to answer the question of what to do, but first shine a light on the *ways* in which science teachers express vulnerability and also what they express vulnerability *about*. The primary implication of this thesis is the furthering of those two aspects in research. The epistemological underpinnings of science education do not currently place emotion and vulnerability alongside predominant schools of thought. Despite this, problem-solving, and ethical decision making require vulnerability making it all the more important to science research, teachers, and their students. There have been calls for further study to better understand and support teachers in attending to emotional experiences, particularly in relational ways (Buchanan & Mills, 2020; Hufnagel, 2019). Additionally, there continues to be a need for "conceptually sound and methodologically rigorous attention" in research on vulnerability (Kelchtermans, 2005, p. 1005). This thesis contributed toward these broad needs within the field by focusing on prominent features of expressions of vulnerability and aspects of what teachers expressed vulnerability about, however there remains progress to be made.

This thesis sought to address both aspects by incorporating a conceptualization of vulnerability with existing methodological considerations in research on emotions in science education. In doing so, I have laid groundwork to further the study of vulnerability as it requires much more attention. This thesis was not exhaustive and there remain many aspects of

vulnerability in science education not addressed here. The interaction of discursive features in conveying vulnerability remains somewhat ambiguous and would be an area of importance in future research. Additionally, this dataset was from school year 2018-2019. It is overwhelmingly obvious that education has undergone significant shifts through the pandemic. Addressing distance learning, masking, social distancing, additional stress, and uncertainty, as well as many other factors educators faced during the pandemic are all spaces in which to further elucidate vulnerability. Considering the role of social norms and expectations in vulnerability, further study should be done to take a more nuanced and detailed approach to the variety of factors which compose social norms of teacher colleagues in spaces where vulnerability arises. This study focused on teacher vulnerability in interaction with colleagues, but future attention should also be paid to vulnerability in the classroom in the presence of students during the active teaching process, during administrator observation, and many other experiences teachers have in their professional lives.

Vulnerability is ontological; it is natural to human existence and interaction (Butler, 2004; Gilson, 2011). As we face an ever changing (and overlapping) social, political, and educational landscape it is imperative that we further understand the facets of our emotional communication, especially in the face of discomfort and differences. Teachers care deeply for and about their students and have also faced deeply challenging times, especially in the last few years. We must continue to attend to their emotions, needs, and vulnerability in order to cultivate an education system in which spaces of discomfort are not simply avoided, but instead transformative. If science education research incorporates both a wider and more critical lens regarding what counts as knowledge and ways of knowing, that transformation will be better supported.

REFERENCES

Alsop, S. (2005). Bridging the Cartesian divide: Science education and affect. In S. Alsop (Ed.), *Beyond Cartesian Dualism: Encountering Affect in the Teaching and Learning of Science* (Vol. 29, pp. 3–16). Springer.

Avalos, B. (2011). Teacher professional development in Teaching and Teacher Education over ten years. In *Teaching and Teacher Education* (Vol. 27, Issue 1, pp. 10–20). https://doi.org/10.1016/j.tate.2010.08.007

Barasch, A. (2020). The consequences of sharing. *Current Opinion in Psychology*, *31*, 61–66.

Barrett, L. F. (2006). Solving the emotion paradox: Categorization and the experience of emotion. *Personality and Social Psychology Review*, *10*(1), 20–46.

Boiger, M., & Mesquita, B. (2012). The construction of emotion in interactions, relationships, and cultures. *Emotion Review*, *4*(3), 221–229.

Bruk, A., Scholl, S. G., & Bless, H. (2018). Beautiful mess effect: Self–other differences in evaluation of showing vulnerability. *Journal of Personality and Social Psychology*, *115*(2), 192.

Buchanan, R., & Mills, T. (2020). Vulnerability, Discomfort, and Diaphanous Spaces: Opportunities for Intimate Pedagogy and Scholarship. In E. Lyle & S. Mahani (Eds.), *Sister scholars: Untangling issues of identity as women in academe* (pp. 241–250). Dio Press.

Bullough, R. v. (2005). Teacher vulnerability and teachability: a case study of a mentor and two interns. *Teacher Education Quarterly*, *32*(2), 23–39. https://go.exlibris.link/q5f4JNjf

Butler, J. (2004). *Precarious life: The powers of mourning and violence*. verso.

Day, C., & Leitch, R. (2001). Teachers' and teacher educators' lives: the role of emotion. *Teaching and Teacher Education*, *17*, 403–415.

Gallo-Fox, J. (2010). Risk-Taking as Practice in a Coteaching Professional Learning Community. In K. Murphy Colette and Scantlebury (Ed.), *Coteaching in International Contexts: Research and Practice* (pp. 109–128). Springer Netherlands. https://doi.org/10.1007/978-90-481-3707-7_6

Gee, J. P. (2010). *An introduction to discourse analysis: Theory and method*.

Gee, J. P., & Green, J. (1998). Discourse analysis, learning, and social practice: A methodological study. *Review of Research in Education*, *23*, 119–169.

Gilson, E. (2011). Vulnerability, ignorance, and oppression. *Hypatia*, *26*(2), 308–332.

Gilson, E. (2013). *The ethics of vulnerability: A feminist analysis of social life and practice*. Routledge.

Gilson, E. C. (2018). Beyond bounded selves and places: The relational making of vulnerability and security. *Journal of the British Society for Phenomenology*, *49*(3), 229–242.

Goodwin, C. (1994). Professional vision. *American Anthropologist*, *96*(3), 606–633.

Goodwin, C. (1997). The Blackness of Black: Color Categories as Situated Practice. In L. B. Resnick, R. Säljö, C. Pontecorvo, & B. Burge (Eds.), *Discourse, Tools and Reasoning* (pp. 111–140). Springer. https://doi.org/10.1007/978-3-662-03362-3_6

Graham, S. M., Huang, J. Y., Clark, M. S., & Helgeson, V. S. (2008). The positives of negative emotions: Willingness to express negative emotions promotes relationships. *Personality & Social Psychology Bulletin*, *34*(3), 394–406.

Gumperz, J. J. (1982). Contextualization conventions. In *Discourse Strategies* (Issue 1, pp. 130–152). Cambridge University Press.

Hargreaves, A. (2001). The emotional geographies of teachers' relations with colleagues. *International Journal of Educational Research*, *35*(5), 503–527. https://doi.org/https://doi.org/10.1016/S0883-0355(02)00006-X

Hufnagel, E. (2015). Preservice elementary teachers' emotional connections and disconnections to climate change in a science course. *Journal of Research in Science Teaching*, *52*(9), 1296–1324. https://doi.org/10.1002/tea.21245

Hufnagel, E. (2018). Frames for emotional expressions across discourse forms in an ecology course. *International Journal of Science Education*, *40*, 1–23. https://doi.org/10.1080/09500693.2018.1515512

Hufnagel, E. (2019). Emotional discourse as constructed in an environmental science course. In G. J. Kelly & J. L. Green (Eds.), *Theory and Methods for Sociocultural Research in Science and Engineering Education* (pp. 155–180). Routledge.

Hufnagel, E., & Kelly, G. J. (2018). Examining emotional expressions in discourse: methodological considerations. *Cultural Studies of Science Education*, *13*(4), 905–924. https://doi.org/10.1007/s11422-017-9806-4

Jaber, L. Z., & Hammer, D. (2016). Engaging in science: A feeling for the discipline. *Journal of the Learning Sciences*, *25*(2), 156–202.

Jaber, L. Z., Hufnagel, E., & Radoff, J. (2021). "This is Really Frying My Brain!": How Affect Supports Inquiry in an Online Learning Environment. *Research in Science Education*, *51*(5), 1223–1246. https://doi.org/10.1007/s11165-019-09884-y

Jeong, A., & Frazier, S. (2008). How day of posting affects level of critical discourse in asynchronous discussions and computer-supported collaborative argumentation. *British Journal of Educational Technology*, *39*(5), 875–887.

Kelchtermans, G. (1996). Teacher Vulnerability: understanding its moral and political roots. *Cambridge Journal of Education*, *26*(3), 307–323.

Kelchtermans, G. (2005). Teachers' emotions in educational reforms: Self-understanding, vulnerable commitment and micropolitical literacy. *Teaching and Teacher Education*, *21*(8), 995–1006.

Kelchtermans, G. (2009). Who I am in how I teach is the message: self-understanding, vulnerability and reflection. *Teachers and Teaching, Theory and Practice*, *15*(2), 257–272.

Kelchtermans, G. (2011). Vulnerability in teaching: The moral and political roots of a structural condition. In C. Day & J. C.-K. Lee (Eds.), *New Understandings of Teacher's Work Emotions and Educational Change* (pp. 65–82). Springer Netherlands. https://doi.org/10.1007/978-94-007-0545-6_5

Kelly, J. (2013). Professional learning communities: the emergence of vulnerability. *Professional Development in Education*, *39*(5), 862–864. https://doi.org/10.1080/19415257.2012.753932

Kemmis, S., Heikkinen, H. L. T., Fransson, G., Aspfors, J., & Edwards-Groves, C. (2014). Mentoring of new teachers as a contested practice: Supervision, support and collaborative self-development. *Teaching and Teacher Education*, *43*, 154–164. https://doi.org/10.1016/j.tate.2014.07.001

Lasky, S. (2005). A sociocultural approach to understanding teacher identity, agency and professional vulnerability in a context of secondary school reform. *Teaching and Teacher Education*, *21*(8), 899–916. https://doi.org/10.1016/j.tate.2005.06.003

Peters, K., Kashima, Y., & Clark, A. (2009). Talking about others: Emotionality and the dissemination of social information. *European Journal of Social Psychology*, *39*(2), 207–222.

Reiss, M. J. (2005). The importance of affect in science education. In S. Alsop (Ed.), *Beyond Cartesian Dualism: Encountering Affect in the Teaching and Learning of Science* (29th ed., Vol. 29, pp. 17–26). Springer.

Rimé, B., Bouchat, P., Paquot, L., & Giglio, L. (2020). Intrapersonal, interpersonal, and social outcomes of the social sharing of emotion. *Current Opinion in Psychology*, *31*, 127–134.

Shiota, M. N., Sauter, D. A., & Desmet, P. M. A. (2021). What are 'positive'affect and emotion? *Current Opinion in Behavioral Sciences*, *39*, 142–146.

Uitto, M., Kaunisto, S. L., Kelchtermans, G., & Estola, E. (2016). Peer group as a meeting place: Reconstructions of teachers' self-understanding and the presence of vulnerability. *International Journal of Educational Research*, *75*, 7–16. https://doi.org/10.1016/j.ijer.2015.10.004

Vedder-Weiss, D., Hufnagel, B., Jaber, L. Z., Finkelstein, C., Dini, V., McGugan, K. S., Garner, B., Horn, I., Maslaton, R. T., & Lefstein, A. (2020). *Socio-emotional dynamics in teacher learning*.

Zembylas, M. (2004). Emotional issues in teaching science: A case study of a teacher's views. *Research in Science Education*. https://doi.org/10.1007/s11165-004-0287-6

Zembylas, M. (2005a). Discursive practices, genealogies, and emotional rules: A poststructuralist view on emotion and identity in teaching. *Teaching and Teacher Education*, *21*(8), 935–948. https://doi.org/https://doi.org/10.1016/j.tate.2005.06.005

Zembylas, M. (2005b). Emotions and science teaching: Present research and future agendas. In S. Alsop (Ed.), *Beyond Cartesian Dualism* (29th ed., pp. 123–132). Springer. https://doi.org/10.1007/1-4020-3808-9

Zembylas, M. (2011). Teaching and teacher emotions: A post-structural perspective. In C. Day & J. C.-K. Lee (Eds.), *New Understandings of Teacher's Work: Emotions and Educationcal Change* (Vol. 6, pp. 31–43). Springer.

Zembylas, M. (2016). Making sense of the complex entanglement between emotion and pedagogy: Contributions of the affective turn. *Cultural Studies of Science Education*, *11*(3), 539–550.

Zembylas, M. (2017). Wilful ignorance and the emotional regime of schools. *British Journal of Educational Studies*, *65*(4), 499–515.

BIOGRAPHY OF THE AUTHOR

Eliza Jacobs originates from Shapleigh, Maine along with her parents and two sisters. A student from a young age, she was fascinated with soaking up any and all knowledge. She attended "junior researcher" summer camp at Wells Reserve in Wells, Maine at age 10, sparking her interest in biology, ecology, and the environment. She went on to graduate from Berwick Academy in 2011. She attended Hood College in Frederick, Maryland where she completed her B.A. in Environmental Science and Policy with a concentration in Environmental Biology and a minor in Women's Studies. She entered the education field after completing her bachelor's degree and began substitute teaching. She accepted her first teaching position as a kindergarten teacher in Seoul, South Korea where she taught for 2 years and earned her TESOL certification. Following her return to the States she worked as an educational technician and a case manager for exchange students studying in New England before entering graduate school. She will complete her M.S. in Teaching from the University of Maine in May 2022 and continue to work in the field of education research. When she's not working, she enjoys running, throwing pottery, canoeing, kayaking, hiking, skiing, gardening, and much more. She resides in Portland, Maine. Eliza is a candidate for the Master of Science in Teaching from the University of Maine in May 2022.