

STUDENT ENGAGEMENT AND STUDENT VOICES

Peggy Trygstad

A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the School of Education.

Chapel Hill
2010

Approved by:

Jocelyn Glazier, Ph.D.

Cheryl Bolick, Ph.D.

Jennifer Coble, Ph.D.

Eileen Parsons, Ph.D.

Lynda Stone, Ph.D.

© 2010
Peggy Trygstad
ALL RIGHTS RESERVED

ABSTRACT

Peggy Trygstad: Student Engagement and Student Voices
(Under the direction of Jocelyn Glazier)

Through classroom observation, digital videos, and face-to face-interviews, this study investigated the phenomenon of student engagement within one inquiry-oriented secondary science classroom. The data suggests that students engage in very different ways and these individual approaches often do not match with the narrow vision of engagement held by classroom teachers and espoused in existing research literature. Classroom behaviors are frequently misread and misinterpreted when students are not given opportunities to explain what their behaviors mean. Furthermore, students cited an array of emotional, cognitive, and intangible factors that significantly impact their behavioral engagement on a daily basis. This study provides an in-depth analysis and description of student engagement across behavioral, emotional and cognitive dimensions that rely on both verbal and nonverbal aspects of student voices.

ACKNOWLEDGEMENTS

To my advisor, Jocelyn Glazier, whose support, encouragement and generosity of time allowed me to reach the finish line of this long doctoral journey. Thank you for being my mentor, teacher, advocate and confidant. You inspire me to want to grow as both a professional and a person.

To the other members of my dissertation committee, Cheryl Bolick, Jennifer Coble, Eileen Parsons, and Lynda Stone, whose thoughtful feedback and endless encouragement pushed me to produce a dissertation I could be proud of. I am honored and privileged to have had the opportunity to work with such a talented and successful group of women.

To my former advisors, William Veal and Dwight Rogers, for your guidance and encouragement as I began my graduate studies. Thank you for taking a chance on me.

To “Mrs. Jackson,” a shining example of what a secondary science teacher should be. Thank you for allowing me a glimpse of the amazing things happening in your classroom. Without your collaboration, this research study would not have been possible.

To the honors biology students who participated in this research study. Thank you for using your voices to help me understand your classroom engagement experiences. You are amazing young people and I wish you the very best in all of your future endeavors.

To Sarah and Amy, my original cohort. We began as classmates and ended up as friends. I am extremely thankful to have shared some of my most important milestones in life with the two of you.

To “the girls” who took this journey with me, Jennifer, Kari, Kelley, Meghan and Stephanie, for countless memories and endless laughter. Thank you for encouraging me and believing in me when my confidence faltered. I am forever grateful and proud to stand beside you as colleagues.

To Amanda and Hannah, my best friends. A person is lucky to find one friend in life who accepts them unconditionally. I found two.

To my sister, Penny, who is the first person I turn to in each and every situation that comes my way. I love our private jokes and stories that only sisters can understand. Your friendship means more to me than you can possibly know.

To my parents, Ken and Ruth, for your unwavering love and support. Thank you for always believing in me and for making countless sacrifices so that I could follow my dreams. I don’t say it often enough but I love you, I admire you and I appreciate you.

To my daughter, Ellie, the light of my life. I am so proud to be your Mommy and I look forward to each new day together. Your future is wide open and I am confident you can accomplish anything you set your mind to.

To my husband, Troy, the love of my life. Thank you for challenging me to do more and be more than I ever give myself credit for. I never would have succeeded in this journey without your love, understanding and support. This is one more chapter in our crazy book of life and I wouldn’t trade it for the world.

TABLE OF CONTENTS

CHAPTER ONE: Introduction	1
What is Engagement?	2
Why Engagement?	3
Chapter Descriptions	6
CHAPTER TWO: Connections to the Literature	8
Engagement Defined	9
Models of Student Engagement	10
Measures of Student Engagement	12
Student Voice	14
Importance of Student Engagement within Secondary Science Classrooms	22
Connections between Scientific Literacy and Engagement	24
CHAPTER THREE: Methodology	26
Research Design	26
Teacher Participant	27
Student Participants	30
Data Collection	33
Data Analysis	40
CHAPTER FOUR: Mrs. Jackson	47
The Classroom	48

Background	49
Inquiry Pedagogies.....	50
Mrs. Jackson’s Definition of Student Engagement: “They’re involved in the learning”	52
Impacting Student Engagement	54
CHAPTER FIVE: Owen	57
Owen’s Behavioral Engagement: Traditional Pedagogy	57
Owen’s Behavioral Engagement: Inquiry Pedagogy	60
“Vocal Engager”	62
What does Owen’s Behavioral Engagement and Disengagement Look Like?	62
Faking It	68
What Influences Owen to be a Vocal Engager	69
CHAPTER SIX: Kennedy	77
Kennedy’s Behavioral Engagement: Traditional Pedagogy	77
Kennedy’s Behavioral Engagement: Inquiry Pedagogy	80
“Sporadic Engager”	81
What does Kennedy’s Behavioral Engagement and Disengagement Look Like?	82
Faking It	84
What Influences Kennedy to be a Sporadic Engager.....	85
CHAPTER SEVEN: Mateo	91
Mateo’s Behavioral Engagement: Traditional Pedagogy	91
Mateo’s Behavioral Engagement: Inquiry Pedagogy	93
“Silent Engager”	94

What does Mateo’s Behavioral Engagement and Disengagement Look Like?	95
Faking It	98
What Influences Mateo to be a Silent Engager	99
CHAPTER EIGHT: Discussion	105
Researcher Voice	105
Conflicting Definitions of Student Engagement	107
Patterns of Focus Student Behaviors	109
Making Meaning	111
Influences on Student Engagement	113
How Are Focus Students Experiences of Engagement Replicated by Others?	120
Making More Meaning	121
Faking It	123
CHAPTER NINE: Implications	128
Implications for Classroom Research	128
Implications for Science Teacher Education	129
Implications for Classroom Teachers	131
Limitations	132
Recommendations for Further Research	134
Final Reflections	136
APPENDIX A: Student Interview Prompts	137
APPENDIX B: Teacher Pre-Study Interview Prompts	139
APPENDIX C: Major Verbal Codes and Subcodes	140

APPENDIX D: Major Nonverbal Codes and Subcodes	142
APPENDIX E: Interpretations and Reinterpretations of Codes	143
REFERENCES.....	148

LIST OF TABLES

Table

4.1	Representative Week of Honors Biology Pedagogy.....	50
5.1	Owen's Verbal Contributions during Traditional Pedagogies.....	63

LIST OF FIGURES

Figure

3.1	Data Analysis Process.....	41
-----	----------------------------	----

CHAPTER ONE

INTRODUCTION

Student engagement in secondary schools is an area of great concern for educators, researchers, parents, and students themselves. Research has suggested that student engagement is crucial to student achievement and advancement (Marks, 2000; Wentzel, 1991). However, far too many students are bored, uninvolved, and disconnected from daily classroom topics and activities (Appleton, 2008; Pierce, 2005). Additionally, many students do not have a sense of belonging at school and do not see how current academic success has a strong influence on their future (Zyngier, 2007; Teese & Polesel, 2003; Apple & Beane, 1999). One way to potentially understand this disconnect between the student and the classroom is by more closely examining student engagement to better understand whether existing perceptions do indeed match with what is actually happening in classrooms with students.

Student engagement is arguably important across all subject matters, yet, it is particularly significant in secondary science. As we live in an increasingly scientific, technological, globally connected world, scientific literacy has personal, national, and global implications. Scientific literacy is no longer a luxury for a select few, but a necessity for all. It is not enough for students to merely pass science classes or perform well on science tests. Many believe that students must do more than merely pass, they must be engaged. Engagement makes it more likely the students are on a trajectory to carry scientific content knowledge and process skills beyond the classroom, in hopes they may expand upon this body of knowledge

and apply the scientific principles and skills to their daily lives. In this manner, engagement becomes both an end and a means to an end (Russell et al., 2005).

An examination of student engagement within a secondary science classroom is also important because contemporary science reform movements advocate inquiry-oriented pedagogies as a way to increase student engagement, enhance student learning, and provide a basis of long term interest and participation in science, technology, engineering and mathematics (NRC, 1996; NSTA, 1994; AAAS, 1990). Yet, while these new pedagogies are slowly making their way into secondary science classrooms, traditional teacher-centered pedagogies are still the norm. Furthermore, previous studies of student engagement have been set in these traditional classroom settings. Therefore, this research will highlight student engagement within an inquiry-oriented science classroom as I believe that examination of student engagement in settings where students are active participants in the learning process may lead to new insights into student engagement.

What is Engagement?

Definitions and classifications of student engagement across the research literature are abundant yet extremely inconsistent. However, while there is no singularly accepted definition of engagement, there is ideological consensus that engagement is a multidimensional construct. Of the numerous characterizations, the three factor model of Fredricks et al. (2004) currently seems to be the most widely used and accepted classification scheme for student engagement and will therefore serve as the model for this research study. Specifically, this model encompasses the three factors of behavior, emotion, and cognition. Behavioral engagement is displayed in student verbal and nonverbal actions. Emotional engagement is connected to students' feelings of belonging within school as related to peers,

teachers and other adults. Cognitive engagement is reflected in personal accountability for learning and mental investment in complex tasks. While these factors do not exert the same influence in all cases, each of the three factors in this model is deemed crucial to the understanding of student engagement.

While student engagement has been widely defined and classified, it has equally been measured in a variety of ways. Student engagement has been measured by teacher ratings, parent ratings, student self-report surveys, and observation of desirable and/or undesirable student behaviors (Caraway et al., 2003; Finn, 1993; Tobin, 1982). However, these measurements are limited as numerous research studies concentrate on one aspect of student engagement, usually behavior, without considering the influence of other factors (Skinner & Belmont, 1993; Newmann et al., 1992; Finn, 1989). With a deficit of literature that examines engagement across multiple dimensions, this research study will not only identify behavioral indicators of engagement but will also strive to explain what student behaviors mean by correlating behavior with emotional involvement and cognitive effort.

Why Engagement?

I became personally invested in the notion of student engagement several years ago when I began teaching secondary science at a public high school. As a new graduate from a traditional undergraduate teacher education program, I was armed with a wide variety of teaching and assessment strategies and committed to utilizing these strategies to build student interest in and connection to the science content. I felt that if I made a conscious effort to consistently vary my teaching style I would find ways to stimulate interest and allow each of my students to be successful. However, I soon found that engagement was not an easy or

predictable task. For instance, Craig¹ was a freshman in my physical science class who never contributed to class unless he was directly called upon to do so. He participated in classroom activities with minimal effort and little enthusiasm. To observe Craig one would get the impression he was bored, tired, and entirely disengaged. Yet, time after time, Craig surprised me with thoughtfully constructed assignments and high marks on unit tests. Where I was convinced he paid little attention to anything being said or done in the classroom, he repeatedly demonstrated his knowledge of the science content and understanding of the science process skills. On some level, Craig was certainly engaged, yet he demonstrated this engagement in ways that were entirely unexpected. Conversely, Kendra was an eager, vocal student in the same physical science class who readily participated in each and every classroom activity. She freely contributed to class discussion, enjoyed hands-on activities, and always completed assignments on time. However, Kendra's work regularly appeared rushed and incomplete and she was rarely able to demonstrate mastery of the science content. While she would do everything that was physically asked of her, Kendra never seemed to exert the mental effort necessary to truly understand or retain the material that was presented. To observe Kendra on a daily basis one would certainly categorize her as engaged, yet I ultimately lacked confidence that she would be able to carry the science content knowledge and process skills beyond the classroom. Frustratingly, I came to the realization that engagement was a complicated construct that was not easily defined, observed or understood. Furthermore, I found that neither behavior nor achievement neatly equated to engagement. As a teacher, it was very difficult for me to tell if my students were truly engaged or not.

In hindsight, I wish that I would have initiated conversations with these individual students to truly understand their experiences within my classroom. I wish I had taken the

¹ All names have been changed.

opportunity to ask Craig why he seemed so disengaged from every activity I presented to him. Was the content too easy? Was he uncomfortable participating in front of his peers? Was he engaged in a way that conflicted with my own definition of engagement? I wish I had taken the opportunity to ask Kendra why she never exerted the mental effort to truly grasp the science content. Was she frustrated because the material was too hard? Was she just too busy with other aspects of life and school? And would she have characterized herself as engaged or was it simply my misperception? Sadly, these are questions I will never know the answers to. Although I invested time in student-centered pedagogies and assessments, I never stopped to gain input from my students and truly listen to what they had to say. I now realize that genuine, open conversations with my students about their behaviors could have greatly impacted my teaching. Whereas I solitarily struggled with student engagement, the students themselves could (and should) have collaborated with me in this undertaking.

To me, this dissertation represents a second chance to personally embrace the topic of student engagement. Drawing primarily from the literature on student engagement and student voice, this research study will provide a thick description of student engagement (behaviorally, emotionally and cognitively) within a single inquiry-oriented high school biology classroom. While it may seem intuitive that an understanding of student engagement should begin with hearing and comprehending what the students themselves say and believe about their relationship to their school, this has rarely been the case (Yazzie-Mintz, 2006). All too frequently, teachers, researchers, parents and other adults speak readily and presumptuously on behalf of young people whose perspective they misunderstand and/or disregard (Fielding, 2001). However, this research study will provide a unique perspective of

student engagement as it was accomplished via deliberate attention to verbal and nonverbal student voices. Accordingly, this study was guided by two main research questions:

1. What are the primary indicators of student engagement (verbal and nonverbal) within an inquiry-oriented high school biology classroom?
2. What do behavioral indicators of engagement mean?
 - a. How do students perceive the connection between their behavior and their emotional involvement within this high school biology classroom?
 - b. How do students perceive the connection between their behavior and the cognitive effort they exert within this high school biology classroom?

While research has demonstrated that outwardly engaged students are more likely to get better grades on assignments and perform better on exams (Klem & Connell, 2004; Finn & Rock, 1997; Miller et al., 1996), this research study will begin to challenge that notion. From my personal experience as a classroom teacher, I have noticed that students whose behaviors match the commonly defined and described characteristics of classroom engagement do not always succeed academically. Furthermore, students whose behaviors do not match these traditional models of engagement oftentimes still do succeed. Therefore, this research study will examine the many different ways in which students engage, under what circumstances students engage, and what types of things influence student engagement.

Chapter Descriptions

In this first chapter, I have introduced the reader to the main focus of this research study as well as the theoretical models that prompted the stated research questions and research methodology. In the second chapter, I situate this study within the research literature on engagement, student voice, and science education reform. Chapter three

provides an explanation and rationale for the research methods I used to collect and analyze my data. My research findings are laid out in chapters four, five, six and seven. In chapter four, I highlight the teaching philosophy and pedagogical choices of Mrs. Jackson, the teacher participant in this research study. Additionally, I discuss the ways in which she describes and defines student engagement and the ways that she influences student engagement. I devote chapters five, six and seven to the experiences of three focus students: Owen, Kennedy, and Mateo. I classify each focus student as a particular type of engager and describe the behaviors that each student demonstrates within this honors biology classroom. Furthermore, I highlight the various things that influence each student to engage in his/her particular way. Chapter eight serves to synthesize and make sense of the focus student experiences. I compare and contrast the behaviors and behavioral influences among the three focus students and discuss how these are replicated among other students in the classroom. In chapter nine, I examine the implications my research study has for classroom research, science teacher education, and classroom teachers. Finally, I discuss the limitations of my study, my recommendations for further research, and reflect on how this research study has impacted my personal understanding of student engagement.

CHAPTER TWO

CONNECTIONS TO THE LITERATURE

Introduction

In the previous chapter, I described the importance and advantages of exploring student engagement within an inquiry-oriented secondary science classroom. I also presented an argument for the necessity of examining student engagement across the multiple factors of behavior, emotion, and cognition. Finally, I described how my commitment to listening to student voices was influenced by my experience as a high school science teacher struggling with a personal view of student engagement that didn't match with my students' demonstrations of engagement.

This chapter serves to further situate this study within the research literature on student engagement, science education reform, and student voice. I will discuss the various ways that the term student engagement has been defined, classified, and measured. Additionally, I will highlight the prevalence of existing research methodologies that do not take into account the multidimensional definitions of student engagement. I will also describe my perceived necessity for research methodologies that simultaneously address the behavioral, emotional, and cognitive aspects of student engagement. Additionally, I will describe the various ways that the term student voice has been defined and used within the educational literature. Furthermore, I will set forth a rationale for the importance of including student voices within a study of student engagement and describe the way that student voices will be conceptualized within this particular research study. Finally, I will

explore the links among student engagement, student voice and science classrooms as they relate to contemporary science education reform movements, scientific literacy and the STEM workplace demands of the 21st century.

Engagement Defined

Definitions of engagement across the research literature are extremely diverse in scope and focus. Russell, Ainley, and Frydenberg (2005) define engagement as “energy in action, the connection between person and activity” (p.1). According to Skinner, Wellborn, and Connell (1990), the term engagement encompasses students’ “initiation of action, effort, and persistence on schoolwork, as well as ambient emotional states during learning activities” (p. 24). Marks (2000) conceptualized engagement as “a psychological process, specifically, the attention, interest, and investment and effort students expend in the work of learning” (p. 154-155). Yet, while there appears to be ideological consensus that engagement is a multidimensional construct, these complex definitions of engagement are all too infrequently incorporated into research methodology. Numerous studies *acknowledge* a multidimensional definition yet simultaneously explore one solitary factor in an effort to understand student engagement. Behavioral engagement is prominently the factor of choice in the research literature, most likely because it involves easily observable indicators of student conduct and participation where students are evaluated according to whether or not their actions correspond with teacher instructions (Spanjers et al., 2008; Kumar, 1991; Peterson et al., 1984; McGarity & Butts, 1984; Tobin, 1982). Emotional and/or cognitive factors of engagement, such as feelings of belonging or mental exertion for complex tasks, are repeatedly included in engagement definitions but are significantly less likely to be

studied since these more internal forms of engagement require a higher level of inference (Sinclair et al., 2003).

Models of Student Engagement

The agreement regarding the multidimensionality of engagement breaks down as researchers espouse various models for the number and type of contributing factors. Historically, the most influential theory of student engagement is Finn's (1989) participation identification model. In this two factor model, behavioral and emotional components are treated as equal contributors to the understanding of student engagement (Marks, 2000; Finn, 1989). Behavioral engagement is reflected in attendance, punctuality, positive conduct, and by participation and physical involvement in classrooms and other school activities. It is a measure of the degree to which student actions correspond with teacher directives. In other words, the more punctual, present, well-behaved and physically participatory a student is, the more engaged. Emotional engagement (sometimes called affective engagement) encompasses the positive and negative feelings toward teachers, peers, and school in general. It is a measure of “belonging” and feeling a part of the school community that is presumed to influence the willingness to authentically engage in school work. Additionally, emotional engagement refers to the extent to which students perceive school relevant to their future lives. In other words, the more a student feels a sense of belonging in school and sees school as relevant to his or her life, the more engaged.

After a review of the existing definitions and measures of student engagement, Fredricks et al. (2004) proposed a three-factor model consisting of behavioral, emotional, and cognitive components. The authors retained the two-factor model definitions of behavioral and emotional engagement while adding cognitive engagement as a gauge of ownership and

investment. Students who are cognitively engaged are willing to exert the mental and physical effort to tackle intricate tasks and understand complex ideas. These students seek out challenges, have goals for achievement, and take personal responsibility for their own learning (Zimmerman, 1990). The three factors in this model are each deemed important to the understanding of student engagement but are not assumed to contribute equally; the factors become more or less relevant depending on the particular student and classroom situation. Furthermore, this partitioning of engagement into three parts does not imply that they are isolated, independent factors. Rather, Fredricks et al. (2004) discuss their interplay in past research and call for further research that unites the behavioral, emotional, and cognitive dimensions of engagement in meaningful ways.

Most contemporarily, four factor models of student engagement have been proposed that include academic, behavioral, cognitive, and psychological pieces (Appleton et al., 2006; Reschly & Christenson, 2006). In this four factor model, academic engagement consists of variables such as time on task, credits earned toward graduation, and homework completion. Quite similarly, behavioral engagement is reflected in attendance, disciplinary action taken against the student, voluntary classroom participation, and extra-curricular participation. The cognitive and psychological pieces of this four-factor model closely mirror the cognitive and emotional factors discussed in earlier models. Cognitive engagement includes self-regulated learning, perceived relevance of schoolwork to future aspirations, and goal setting. Psychological engagement considers feelings of school identification and belonging in relation to teachers and peers. These four pieces are not believed to equally contribute to student engagement in all situations. Rather, they are used to understand the many features that impact the relationship between the student and the learning environment.

Of the numerous characterizations, Fredricks et al. (2004) three factor model currently seems to be the most widely used and accepted classification scheme for student engagement (Caraway, 2003; Jimerson et al., 2003) and will serve as the theoretical model for this dissertation. What seems to be missing from the two-factor model is an important cognitive piece that acknowledges student autonomy. If students are to become forward thinkers and active leaders, it is important to understand the conditions under which they are willing to take charge of their own learning. Conversely, while the four-factor model parses the behavioral component into smaller, easier-to-measure categories, it does not seem to add anything new to the engagement discussion. Also, because half of this model is devoted to behavior, it may ultimately run the risk of continuing in the vein of behaviorally dominant research.

Measures of Student Engagement

Behavior is the most frequently considered aspect of engagement within the education literature (Spanjers et al., 2008; Kumar, 1991; McGarity & Butts, 1984; Peterson et al., 1984; Tobin & Capie, 1982). However, I would assert that research results should be interpreted cautiously when behavior is considered as the sole or dominant measure of engagement because behavioral indicators of engagement do not always translate to the outcomes that might be expected. It is a sad reality that many students simply endure 13 years of schooling at minimum participation and do just enough to pass classes and eventually gain a diploma (Pierce, 2005; Fullarton, 2002). Research suggests that these disengaged students are likely to struggle academically as participation is believed to increase cognitive development (Greenwood et al., 2002). Conversely, many students are very good at “doing school” and experience great academic success because they meet the

expectations of regular attendance and rule compliance. Research suggests that these behaviorally engaged students regularly excel on assignments and exams (Klem & Connell, 2004; Finn & Rock, 1997; Miller et al., 1996). Yet, as a secondary science teacher, I frequently encountered situations where the aforementioned research findings did not consistently hold true. I encountered students who were not obviously engaged in a behavioral sense, but still displayed evident internal motivation and content mastery via assessments. Additionally, some of my most apparent behaviorally engaged students did not experience overwhelming success in terms of content mastery and retention. I do not believe that my personal observations of these exceptions to the expected engagement outcomes are unique. For instance, Peterson et al. (1984) found that some students in a mathematics classroom who were observed to be on-task later reported that they were not thinking about the material while many students who appeared to be off-task were actually cognitively engaged in trying to relate new ideas to what they had already learned. Therefore, I would contend that behavior can provide useful indicators of engagement but cannot always adequately explain what these indicators mean. Thus, research on engagement must encompass more than behavior.

While I have reservations about using behavior as a sole measure of engagement, I believe it is equally unwise to consider emotional or cognitive factors solitarily. For example, a student may claim high levels of emotional engagement on a self-report survey yet behaviorally act hostile or indifferent towards the teacher and/or her peers. Clearly, it would be inaccurate to categorize this student as “engaged” without observing the student to see how her declared engagement matches with her demonstrated engagement, namely her behavior. Likewise, a student may be viewed as cognitively engaged because he/she scores

high marks on assignments and exams. However, there is no guarantee the student is engaged insofar as he/she has retained the academic material, applied it to his/her everyday life, or decided to pursue it further after high school (Willms, 2003). Far too many studies of engagement have centered on defining and examining its individual components, namely student behavior, emotion and cognition (Skinner & Belmont, 1993; Newmann et al., 1992; Finn, 1989). However, some scholars are now suggesting that the term engagement itself should be specifically reserved for research where multiple factors are present (Guthrie & Wigfield, 2000) rather than one or two. If engagement is thought to be a multidimensional construct, a single factor can merely provide insights into engagement but cannot give the full picture. These three factors are dynamically interrelated within the individual and are not isolated processes (Fredricks, 2004). Therefore, I believe that researchers must develop and adopt research methodologies that simultaneously consider students' behavioral, emotional and cognitive investment to ascertain what engagement looks like and better understand what behavioral indicators of engagement might mean. To this end, I would propose consideration of student voice as a way to effectively merge these three constructs.

Student Voice

The topic of student voice has been given noticeable attention in research literature over the past decade. (Basu, 2008; Furman & Calabrese Barton, 2006; ESRC, 2004; Fielding, 2004). Within the literature on student voice, some argue that students have significant things to say about schools (ESRC, 2004; Mirta, 2004) and that it is crucial to understand and respect student perspectives (Fielding 2004; Cook-Sather, 2002). Yet, student voice is more often considered as a means to some desired endpoint that ranges from “radical reform of the school, the curriculum, and/or the pedagogy to more efficient school management and

governance, improved standards, increased student motivation, enhanced school effectiveness and the renewal of civic society” (Jenkins, 2006, p. 50).

Furthermore, while the term student voice is widely used, it is difficult to ascertain a clear, concise definition of it across the research literature. Fletcher (Online, Accessed, January 5, 2010) defines student voice as "the distinct ideas, opinions, attitudes, knowledge, and actions of young people as they express themselves regarding schools". Student voice has also been defined as “focus[ing] more directly on what students think about the form, content, and purpose of their school science education and exploring the curriculum and pedagogical implications of the findings” (Mitra, 2004, p. 51). In another instance, Rogers (2005) defines student voice as “the active opportunity for students to express their opinions and make decisions regarding the planning, implementation, and evaluation of their learning experiences” (p. 3). While there are similarities among these definitions, each reflects distinct key ideas about what student voice is and why it matters.

While student voice has been explored across a range of academic disciplines, there are some compelling reasons why consideration of student voice is particularly important in science education. For example, there is an established body of literature that examines students’ feelings, thoughts, biases, and stereotypes regarding science and scientists (Mason, Kahle and Gardner 1991; Chambers, 1983). This attention to student voice allows teachers to address student concerns and misconceptions and recognize changes in perspectives over time. Additionally, Polman and Pea (2001) have identified student voice as a necessary component of a process they call “transformative communication”. The authors describe “transformative communication” as an interactive process that allows the teacher to guide student participation while students are at the same time able to actively inquire. It is a social

process whereby the teacher and student together create meanings that neither one alone brings to the interaction. Polman and Pea assert that this “transformative communication” can ultimately be used as a tool to help support scientific inquiry pedagogies that are open ended and student directed. Moreover, Jenkins (2006) notes that the sciences, particularly the physical sciences, are infrequently chosen as an area of advance study, especially among women. Data from the National Science Foundation (accessed December 2, 2008) highlights these important gender distinctions. While, 50.5% of bachelor’s degrees in science and engineering in 2006 were earned by women, a significant shift from only 24.8% in 1966, this number declines to 44.9% of earned master’s degrees and 38.5% of earned doctorates for women in 2006. While these percentages do represent significant gains across time (13.3% of master’s and 8.0% of doctorates in 1966 were awarded to women), it is apparent that women still do not have equal representation in the upper echelon of science and engineering. Thus, Jenkins (2006) asserts, “The untested assumption is that the more that is known about students’ interests, enthusiasms, dislikes, beliefs and attitudes, the more feasible it will be to develop school science curricula that will engage their attention and help to reduce long-standing gender and other differentials” (p. 51).

Student Voice and Feminist Epistemology

My way of thinking about student voice is influenced by my background as a female immersed in a scientific discipline. While I did not choose to incorporate a feminist methodology within this research study, I believe that tenets of a feminist epistemology are useful in thinking about student voice and ultimately student engagement. Traditional notions of research are based on the beliefs that definite knowledge and truths are waiting to be discovered via appropriate research methods. In contrast, a feminist epistemology

contends that knowledge is instead situated according to the unique perspective of the knower (Anderson, 2009; Duran, 1991). This is not a notion that is unique to feminist epistemology but is also replicated among critical epistemologies and critical pedagogies. Additionally, a feminist epistemology acknowledges a multiplicity of voices and asserts that knowledge cannot be generalized from one person to another (Duran, 1991; Ellsworth, 1989). While much research involving student voice has been oriented toward an understanding of students' collective voice toward schooling and instruction (Furman & Calabrese Barton, 2006), feminist notions of multiple truths and multiple perspectives caused me to question the very term "student voice," which implies one voice that speaks for all students. In direct relation to student engagement, Furman and Calabrese Barton (2006) advocate for analysis of individual student voices without presuming the existence of a generic voice. They assert that by "recognizing students' individualities, we can understand the richness of their purposes and motivations to engage in science learning and the development of their science identities" (p. 670-671).

Ellsworth (1989) problematizes the term student voice even further by suggesting that each person possesses multiple voices that are expressed differently given the particular setting and situation. As such "it is impossible to speak from all voices at once, or from any one, without the traces of the other being present and interruptive" (Ellsworth, p. 310). A teacher may be given access to one piece of a students' voice but can never truly know the full scope of his/her experiences, oppressions, and understandings (Ellsworth, 1989). Additionally, the voice that is expressed in one particular context may be vastly different in a different context. Thus, as a researcher, I must bear in mind that each student has a voice that is much more complex than I will ever be able to comprehend and that voice is dynamic

rather than static. Thus, it is important for me to acknowledge that my research study is ultimately partial as it offers some insights into student engagement but may essentially only scratch the surface.

Student Voice within the Engagement Literature

Within the engagement literature, student voice has been included (yet rarely named as such) via self-report surveys, interviews and observational techniques. Yet attention to student voice is most often limited and relatively incomplete. Too often students are observed and judged without being given the opportunity to explain their behaviors (Spanjers et al., 2008; Roadrangka & Yeany, 1985). Students are asked to fill out standardized self-report surveys that allow little room for clarification, explanation or follow-up (Spanjers et al., 2008; Yazzie-Mintz, 2006). As researchers limit their research to one aspect of engagement, they also limit their access to and value of student voice.

It is also important to consider that lack of student voice within a classroom may itself contribute to disengagement. Cook-Sather (2005) maintains that “[t]here is something fundamentally amiss about building an entire [education] system without consulting at any point those it is ostensibly designed to serve”. Students are frequently viewed as products of teacher and administrator efforts rather than as producers of their own knowledge. Furthermore, it is commonplace to talk *about* students rather than carrying out meaningful conversations *with* them (Fielding, 2001). This attitude is reflected in my own past experiences as a classroom teacher wherein I never envisioned students as collaborators. The traditional notions of classroom hierarchy and separation of teacher and student power were a very real, taken for granted part of all my past educational experiences. This time-honored mindset might best be described as the “banking concept” of education (Freire, 2004). The

“banking concept” of education set forth by Paulo Freire describes the dominant paradigm in education where teaching is viewed as nothing more than narration of content. The task of teaching is to lead students to mechanically memorize content as if they were empty containers needing to be filled. Thus, within this banking concept, there is no true student-teacher partnership because students are assigned a passive role with no real voice or power. If one considers that high school students spend as many as 35 or more hours per week feeling silenced and powerless within their schools, it is completely reasonable to suppose they could become frustrated and disengaged. Yet, research encouragingly shows that students who are given a voice in their own schooling display an increase in engagement (Baldwin, 2004; ESRC, 2004; MacBeath, Demetriou, Rudduck & Meyers, 2003). Thus, I would assert that student voice is a critical piece of any research study involving student engagement.

Student Voice and Science Reform

Secondary science education has a historically prevailing teacher-centered pedagogy of rigidity and memorization with passive transmission of STEM knowledge from the teacher to the student. The dominant paradigm that guides teaching is telling (Schultz, 2003). Within the majority of high school science classrooms the pedagogical norm consists of lecture, large group instruction, and strictly structured laboratory activities. The primary focus is on teacher delivery of large amounts of factual material in a short period of time while students sit passively by and absorb the information. Students are then administered written assessments that ascertain the degree to which they retain this science content in the short term. However, when students are regarded as consumers rather than producers of knowledge, there is very little space for their voices to be heard (Schultz, 2003; Moll, Amanti,

Neff, and Gonzalez, 1992). Additionally, this traditional approach directly opposes contemporary science education reform movements (NRC, 1996; NSTA, 1994; AAAS, 1990) that strive to actively engage students in construction of their own knowledge. These reform movements advocate inquiry science pedagogies which provide student voices a “central place in the learning process, as students learn to pose questions, gather and analyze evidence and construct arguments based on it, and communicate their findings to others” (Furman & Calabrese Barton, 2006, p. 668).

It has been suggested that the key to student engagement lies more with pedagogical strategies than the content itself (Tytler, et al., 2008). While science curriculum has a historically prevailing teacher-centered pedagogy of rigidity and memorization, there is much evidence that learning is greatly enhanced when teachers instead use pedagogies that are active, varied, experiential, challenging, and tied to real-world issues (Russell et al., 2005; Driscoll, 2000). Furthermore, active and engaging pedagogies provide opportunities for collaboration and communication that affords students some measure of autonomy (Russell et al., 2005) and strengthen student interest in STEM content. Therefore, a more contemporary pedagogy that treats students as stakeholders in the educational process may increase student engagement.

Over the past 20 years the three major science reform efforts have called attention to the link between inquiry pedagogies and increased student engagement (NRC, 1996; NSTA, 1994; AAAS, 1990). As a result, state and national standards have been adopted that encourage science instruction that focuses on problem-solving and inquiry -- activities that characterize the pursuits of scientists, foster scientific literacy, and increase student engagement in STEM. In 1990, the American Association for the Advancement of Science

published a document entitled *Science for all Americans*. This document outlines a definition of scientific literacy that advocates the need for all citizens to understand key principles of science and technology so they can apply this knowledge to everyday situations in the natural and social world. *Science for all Americans* recommends that students come to this understanding by engaging in scientific inquiry.

Likewise, in 1994, the National Science Teachers Association published a document entitled *Scope, Sequence, and Coordination*. This document focuses primarily on reforming secondary science. It is recommended that secondary science curriculum be restructured so that it is thoughtfully sequenced to provide coherence and natural flow among the currently separate disciplines of biology, chemistry and physics. Furthermore, *Scope, Sequence, and Coordination* asserts that students need a curriculum that is practical, relevant, hands-on, and engaging.

Arguably, the most involved, far-reaching contemporary reform effort was the 1996 publication of the *National Science Education Standards (NSES)* by the National Research Council. This reform movement calls for students to experience science in authentic ways that mimic the actions and reasoning processes of “real scientists”. Additionally, *The Standards* call for a balance between content knowledge and the development of analytical, critical thinking, and problem-solving skills. Student learning is viewed as an active process that is both “hands-on” and “minds-on”. In this way, students are physically and mentally engaged and learning science becomes something that students do rather than something that is done to them.

Importance of Student Engagement within Secondary Science Classrooms

As we live in an increasingly scientific, technological, globally connected world, scientific literacy has personal, national, and global implications. Contemporary science education reform initiatives (AAAS, 1990; NSTA, 1994; NRC, 1996) insist that all people must have equitable opportunities to become scientifically literate citizens. Scientific literacy equips people with the understandings and habits of mind to think independently and make daily choices in the varied life situations they may encounter (NRC, 1996; AAAS, 1990). Scientific literacy is valued as a means to intelligently engage in public discourse and debate about important contemporary issues in science and technology (NRC, 1996). While it is not expected that the majority of students will become experts in a science related field, the science reform initiatives maintain that all people should be able to think critically and share in the personal fulfillment that can come from understanding and learning about the natural world (NRC, 1996).

Scientific literacy is also important at the national level. The United States currently struggles to keep pace with the rest of the world in the areas of science, technology, engineering, and mathematics (Baldi et al., 2007; National Science Board, 2007). The fastest-growing jobs of the future are in these fields and it has been estimated that 90 percent of these jobs will require some postsecondary education (Spellings, 2006). However, there has been a noticeable decline in numbers of students pursuing degrees in science, technology, engineering, and mathematics (STEM). The National Science Foundation has published data of U.S. earned bachelor's, master's and doctorate degrees in science and engineering from 1966 to 2006 (National Science Foundation, 2008). This data calls attention to trends in degree type, degree field, and gender distribution. Across all fields of science and

engineering, the percentage of bachelor's degrees awarded relative to the total number of degrees awarded in all disciplines has steadily declined from 35.2% in 1966 to 32.1% in 2006. This trend holds true for master's degrees as well with an all-time low of 20.5% earned degrees in 2006 compared to a high of 29.2% in 1966. While greater numbers of students are currently pursuing post-secondary education, a smaller percentage of them are choosing science and engineering degree programs.

The National Science Board, the policy-making organization of the National Science Foundation, published a 2007 memorandum asserting that failure to meet the STEM education needs of U.S. students will carry serious implications for our scientific and engineering workforce in the 21st century. They maintain that addressing this issue is absolutely essential for continued economic success and national security. Furthermore, they assert that "all American citizens must have the basic scientific, technological, and mathematical knowledge to make informed personal choices, to be educated voters, and to thrive in the increasingly technological global marketplace (p. v)." Similarly, in 2005 the Business Roundtable teamed up with 15 other major business groups to call for a 100 percent increase in STEM bachelor's degrees within the next decade (Teitelbaum, 2006). However, at present, this call has fallen short with a mere 12% average increase over the past three years (The Chronicle of Higher Education, 2008).

Yet, there is even more at stake than personal fulfillment or U.S. national competitiveness. Today's serious scientific dilemmas are global. There is "unchecked population growth in many parts of the world, acid rain, the shrinking of tropical rain forests and other great sources of species diversity, the pollution of the environment, disease, social strife, the extreme inequities in the distribution of the earth's wealth, the huge investment of

human intellect and scarce resources in preparing for and conducting war, the ominous shadow of nuclear holocaust—the list is long, and it is alarming” (AAAS, 1990). Scientific literacy becomes crucial when we realize that the students of today are expected to become the leaders, inventors and teachers who will use science and technology to solve these global problems.

Connections between Scientific Literacy and Engagement

There is evidence that the majority of students form life aspirations before the age of 14 that are nurtured and transformed into career choices throughout secondary school (Tytler, et al., 2008). Therefore, secondary schools are critical places to implement interventions aimed at engaging students in STEM. Research has demonstrated that engaged students are more likely to get better grades on assignments and perform better on exams (Klem & Connell, 2004; Finn & Rock, 1997; Miller et al., 1996) with a lower incidence of dropping-out (Christensen et al., 2004; Connell et al., 1994). Additionally, engagement in a subject is important for course selection, educational pathways and career choices (Baldi et al., 2007). Students who do not view secondary science curriculum as challenging, meaningful, and applicable to real-world problems have little incentive to pursue this discipline in the future. It is increasingly unclear whether the disengaged students of today will have the skills, knowledge, and fortitude to thrive in an increasingly technological, scientific, and globally connected world. Therefore, if schools are to equip students with STEM knowledge and skills to be innovative leaders, problem-solvers and teachers, it is crucial to understand and address the lack of engagement in secondary science classroom.

Summary

In this chapter, I discussed the various ways that the term student engagement has been defined, classified, and measured. I described how much of the research about student engagement is behaviorally focused and cautioned that behavioral indicators of engagement do not always translate to the outcomes that might be expected. I argued that observable student behaviors can provide useful indicators of engagement but additional measures are needed to explain what these student behaviors mean. Therefore, I advocated consideration of student engagement as a multidimensional construct across behavioral, emotional and cognitive factors. In this chapter I also introduced the idea of considering student voices as a means to better understand student engagement. I made a case for the importance of talking with students about their engagement rather than talking about them without soliciting their voices. Finally, I described the connection between student voices and contemporary science pedagogies that provide student voices a central place in the learning process. I explained how contemporary science pedagogies may positively impact student engagement and may ultimately serve to increase scientific literacy. Collectively, the existing research on student engagement, student voice and science education reform guided the design of my own research study. In the next chapter I will describe my data collection protocol and will discuss the data analyses methods that I used to address my stated research questions.

CHAPTER THREE METHODOLOGY

Introduction

In this chapter I will explain the methods I used to collect and analyze my data. Additionally, I will discuss the theoretical model that influenced my decisions regarding study design, data collection and data analysis.

Research Design

This research study is guided by two major questions:

1. What are the primary indicators of student engagement (verbal and nonverbal) within an inquiry-oriented high school biology classroom?
2. What do behavioral indicators of engagement mean?
 - a. How do students perceive the connection between their behavior and their emotional involvement within this high school biology classroom?
 - b. How do students perceive the connection between their behavior and the cognitive effort they exert within this high school biology classroom?

In order to address these research questions, I implemented a qualitative case study approach within a single high school honors biology classroom. Qualitative research is based on constructivist principles that reality is socially constructed, complex, and ever changing (Glesne, 1999). To understand this reality, qualitative researchers often rely on dialogue and diverse perspectives and seek to make sense of personal stories and the ways in which these stories intersect (Glesne, 1999). A qualitative approach, for example, may allow a researcher

to listen to students, interpret what they have to say, and retell the accounts in straightforward ways that contribute to new perspectives on student understandings and experiences (Glesne, 1999). Furthermore, a qualitative case study approach allows a researcher to explore a bounded system over time through detailed, in-depth data collection involving multiple sources of information (Creswell, 2007). My case, namely one high school honors biology classroom, was a purposeful sample chosen according to several criteria concerning the teacher participant and student participants as explained below.

Teacher Participant

When selecting the classroom in which to conduct this study, I first considered the classroom teacher. Three main factors were taken into consideration when selecting a teacher participant. First, I selected a teacher who had been teaching in a science classroom for at least three years. This three year time span is one of the ways to distinguish experts from novices within the learning to teach literature (Reynolds, 1992). As novice teachers begin their careers, they are confronted with a unique set of challenges, routines, and responsibilities that are beyond the scope of this dissertation. Therefore, I opted for an “expert” teacher with several years of science classroom experience. The teacher participant in this research study, Mrs. Jackson, has 30 years of experience in a secondary science classroom.

Second, because my personal background is in secondary science, I selected a teacher in a secondary science classroom. I believe my experience in secondary science education allowed me to pick up on nuanced actions and interactions that an outsider may not have noticed. My familiarity also allowed me to carry on productive conversations with the teacher and students across the topics of science content and pedagogy and granted me a

somewhat privileged access to student voice as I am familiar with the “language” of secondary science.

Third, I selected a teacher who self-identifies an ideological commitment to inquiry and simultaneously finds ways to utilize a student-centered pedagogy several times each week. I believe that examination of an inquiry-oriented classroom may permit examination of student voice in ways that traditional teacher-centered pedagogies might not. Inquiry pedagogies that afford student voices a central place in the learning process generate a classroom environment where students have space to participate both mentally and physically. Furthermore, student-centered pedagogies help teachers create space for students to experience some level of autonomy and ultimately provide more opportunities for their voices to be heard. For the scope of my dissertation, I will adhere to Colburn’s (2000) definition of inquiry as “the creation of a classroom where students are engaged in essentially open-ended, student-centered, hands-on activities” (p. 42). This definition concentrates on inquiry as a teaching technique and is broad enough to cover many different instructional approaches.

However, while inquiry pedagogies align with theories of how people best learn (Driscoll, 2000) it is extremely difficult to find teachers who incorporate inquiry strategies on a regular basis. There are many reasons for this. For example, some teachers don’t exactly know what inquiry is. The numerous definitions of inquiry are confusing as they exist as both a way of doing science and a way of teaching science (NSES, 1996). Add to this the varying opinions on what types of activities can actually be classified as inquiry. Inquiry is diverse in its scope and exists along a continuum of activities that are more structured to activities that are very open-ended (Colburn, 2000). Additionally, while many teachers have

strong philosophical commitments to inquiry, there are numerous barriers to its implementation. In this era of high stakes testing, the emergence of pacing guides and overwhelming breadth of required content can severely limit teacher autonomy and creativity as they relate to pedagogical choices. Inquiry is also time intensive and requires deep thought and careful planning on the part of the teacher. While inquiry may often be ideal, it is not always feasible. Furthermore, it can be argued that no single pedagogy is ideal in all situations. While inquiry is generally desirable, features of the particular content and particular students must be taken into account when choosing appropriate methodologies. Mrs. Jackson consistently uses inquiry pedagogies on a weekly basis yet she balances these with more traditional pedagogies.

Mrs. Jackson, the teacher participant in this research study, was essentially chosen through the use of snowball sampling. Snowball sampling is used to identify key research participants with a rare set of desired characteristics (Merriam, 2009), in this case a teaching expert in secondary science education with a commitment to inquiry pedagogies. Over the past five years as a graduate student immersed in teacher education, Mrs. Jackson's name constantly surfaced as an exemplar of science teaching among her colleagues as well as university faculty members. She is well-known and well-respected for her student-centered teaching philosophy and the consistent manner in which she puts her philosophy into practice. Her professional knowledge and reputation are unsurpassed among secondary science teachers I have encountered. Furthermore, I personally spent time in her classroom over the past five years as a university supervisor to her student teachers and I have seen firsthand her creative pedagogies, strong content knowledge, and evident rapport with her students. A

discussion of Mrs. Jackson's teaching philosophy, teaching methods, and impressions of student engagement will be provided in Chapter four.

Student Participants

Student participants for this study were identified by their enrollment in a single section of an elective honors biology class taught by Mrs. Jackson. Because the nature of this study is so heavily dependent upon the availability of an appropriate, inquiry-based classroom, recruitment ultimately needed to begin with the teacher. Therefore, the students in this study essentially represent a convenient sample. Students in the course were mainly seniors ranging from 16 to 18 years of age. The school itself has a student population that is approximately 52% male and 48% female. The ethnic/racial make-up of the school is approximately 60% Caucasian, 19% African American, 14% Asian American, 5% Hispanic and less than 1% American Indian. This particular classroom of interest has student diversity that is largely representative of the school as a whole.

Each of the 28 students enrolled in this specific section of honors biology with Mrs. Jackson was invited to participate in the research study and 26 students chose to participate. From these 26 students, three students were selected as a representative focus group. Due to the nature of this research, it was essential that I select the three focus students early in the data collection phase. I spent five days (250 minutes) observing the classroom as a whole and broadly observing every student participant. I then chose focus students according to my observations concerning the phenomenon under investigation. Three students whose behaviors demonstrated examples of engagement and/or disengagement that differed from one another were purposefully selected from the population of students who agreed to participate in the research study. While the three focus students displayed behaviors that

were different from one to another, these behaviors were in fact replicated among many other students in the class. The focus students' behaviors were not atypical.

Since the focus students were selected after a brief period of observation, I relied solely on my initial impressions of student behaviors. These initial impressions were influenced by my personal experiences as a classroom teacher as well as the existing research literature on student engagement that highlights commonly accepted demonstrations of engagement and disengagement. For example, behaviors such as asking questions, raising hands, and physically manipulating laboratory equipment are widely considered to demonstrate engagement while lack of eye contact, silence, and instructional disruptions are widely considered demonstrations of disengagement (Shapiro, 2004; Finn, 1993; Roadranga & Yeany, 1985; Tobin, 1982). I selected one focus student whose behaviors frequently aligned with the commonly accepted indicators of engagement. I selected a second focus student whose behaviors wavered evenly between accepted indicators of engagement and disengagement. I selected a third focus student whose behaviors frequently aligned with the commonly accepted indicators of disengagement.

While behavioral engagement was the overarching criteria for selection of the focus students, student diversity in terms of race and gender was a secondary consideration. I was able to observe and tentatively classify students into similar types of engagement styles. Since groups of students were observed to engage in comparable ways, I purposefully selected focus students from these groups that varied from one another in terms of race and gender. Thus, I attempted to balance the student sample and make it more representative of the class as a whole by including both genders and more than one race.

The behaviors of the focus students were closely monitored and analyzed and they were invited to participate in face-to-face interviews with the researcher on multiple occasions. One of the focus students participated in three face-to-face interviews while the other two focus students each participated in two face-to-face interviews. Each interview was approximately 20 to 25 minutes in length. In total, I collected approximately 155 minutes of interview data for the focal students. In the following sections, I provide brief descriptions and background information regarding each focus student.

Owen

Owen is a 17-year-old Caucasian male. He is a high school senior who plans to attend college after graduation. Although his future area of study is undecided, he was in the process of sending out college applications at the time this study was conducted. Owen is a member of the high school lacrosse team and is a student government representative.

Kennedy

Kennedy is a 17-year-old Caucasian female. She is a high school senior who plans to attend college after graduation and was in the process of sending out college applications at the time this study was conducted. She anticipates her future area of study to be either music or art. Kennedy is especially interested in vocal music and she is a member of both the women's ensemble and mixed a cappella groups at Lincoln High School.

Mateo

Mateo is a 17-year-old Latino male. He is a high school senior who plans to attend college after graduation, although his future area of study is undecided. He was in the process of sending out college applications at the time this study was conducted. Mateo recently moved from his parents' home in Florida to live locally with his older brother. His

motivation for moving was to establish residency in hopes of gaining better odds at admission to a local university from which his older brother was recently graduated. Mateo is a member of the high school baseball team.

Data Collection

I obtained data from several sources in an effort to understand student engagement within the context of one secondary science classroom. Multiple data sources afford a researcher rich contextual descriptions as well as a diverse set of perspectives regarding student engagement. Multiple data sources were also crucial for carrying out methodological triangulation to examine completeness, convergence and discrepancy of key themes, and thus strengthen the reliability and validity of the research findings (Patton, 2002). This research study utilized four main sources of data: observation, digital video recordings, student interviews, and teacher interviews.

Observation

I carried out natural observation with the goal of studying student engagement in a usual classroom setting without incorporating any sort of experimental treatment. As a researcher, I simply observed and carefully recorded events that happened as well as my initial impressions of these events. As a manifestation of this natural observation, I became an observer as participant (Glesne, 1999). I had some limited interaction with the students during the class period, but primarily observed from an unobtrusive location within the classroom. I did not teach or give classroom assistance in any way. While it may be ideal to carry out observations where the participants do not know the purpose of the study, this carries some serious moral and ethical concerns. Instead, I employed overt observation where the subjects were aware they were being studied and the research purpose was

explained. Observation was essential for identifying the primary verbal and nonverbal indicators of student engagement. These behavioral indicators of engagement, such as student questions, time on-task, and conduct, will be discussed in-depth in chapter eight.

Even when an observer is as unobtrusive as possible, an observer effect may still occur. An observer effect occurs when the participants change their behavior in the presence of an observer because they are aware what the researcher studying. I strove to minimize this effect by observing the same groups of students over a period of eight weeks. This honors biology class met five days per week for a 50-minute period each day. I was able to observe 36 class periods for a total of 1,800 minutes of observational data. As the students became more and more comfortable with my presence, this familiarity presumably allowed them to relax and behave in a manner that was the norm for that classroom. This was important so that I, as a researcher, could infer normal classroom practice.

While it has been suggested that pedagogy matters more than content in terms of student engagement (Tytler, et al., 2008; Russell et al., 2005), I felt it was advantageous to collect data across multiple units of instruction within the same classroom. Collecting data over a period of several weeks allowed me to note any possible differences and similarities in student behaviors that occurred across the science content.

I did not consistently observe from a single location within this honors biology classroom. During large instruction where students were seated in their desks I would alternate between the two corners at the front of the room where I could see student faces. During class sessions where students were active and moving around, I would choose a particular focus student or student group that consisted of one or more focus students to exclusively observe. I positioned myself accordingly on the fringe of that workspace and

was conscious of positioning myself so that my presence was as unobtrusive as possible. Additionally, once I selected a classroom vantage point from which to observe, I remained static for the duration of the instructional activity.

Digital Videos

Since classroom interaction is rapid, complex and nuanced, there are limits to the ability to derive meaning from it in real-time (Erickson, 2006). An observer as participant records field notes that capture what he/she deems relevant and important. These field notes reveal an instantaneous interpretation and sense-making of events as they happen. To support these interpretations, digital videos provide a continuous and relatively comprehensive record of social interaction (Erickson, 2006). Digital videos allow the researcher a second look at a given situation to ensure what he/she saw is actually what happened. Furthermore, the amount of data that can be collected with videotape is greater than that of observation and it provides a permanent record that can be returned to repeatedly (Glesne, 1999).

I specifically used digital videos to help identify focus students based on student behaviors, to select additional students for single interviews based on salient classroom incidents and to use as talking points within student interviews. I prepared short video segments of classroom behaviors and asked the students to watch themselves on these videos. In this way, I was able to ascertain whether or not my interpretations of particular student behaviors matched with the student's interpretations of their own behaviors. The digital videos also served talking points where students could begin to explain connections between specific behaviors and their emotion and/or cognition. Furthermore, the digital videos served to capture nonverbal communication that was frequently missed in real-time observation. In

these ways, the videos were crucial for identifying both the primary verbal and nonverbal indicators of student engagement as well as prompting discussion of the meanings behind these behaviors.

I used one digital video camera to record student behaviors concurrent with each classroom observation. The location of the video camera varied depending on the daily instruction. Large group discussion/lecture was recorded from one of the two front corners of the classroom. As Mrs. Jackson regularly positions herself at a projector in the middle of the classroom, this camera placement allowed me to focus simultaneously on the teacher and the students. This camera was statically positioned and I did not make any adjustments to it once classroom instruction began. In this way, I hoped to minimize classroom distractions and interruptions so that my presence was as unobtrusive as possible. In other instances the digital video camera was focused on small groups of students, particularly on days when instruction was devoted to laboratory group work. The camera was strategically positioned per my discussions with Mrs. Jackson regarding the nature of daily instruction. Small groups that were digitally recorded were ideally entirely comprised of students that had given consent/assent to participate in this research study. Furthermore, I specifically chose groups that included one or more of my focus students. I did not make any adjustments to the cameras once they were positioned and classroom instruction had begun. The specific class period that was studied immediately followed lunch and preceded the teacher's planning period. Therefore, I had ample opportunity to set up and take down the digital video camera without interfering with classroom instruction.

Student Interviews

Face-to-face interviews with individual students were essential for gaining an understanding of the motivation and reasoning behind observed behaviors. These interviews were semi-structured with prompts to begin the discussion but offered flexibility to allow students to explore and reveal their thoughts and tell their stories (see Appendix A). Video segments were also used to stimulate discussion in the face-to-face interviews. I allowed students to view segments of videos and reflect upon their classroom behaviors, specifically how these behaviors were related to emotion and cognition. The digital videos served to enhance recall and allowed students to provide richer, deeper insight into their thoughts and feelings.

The face-to-face student interviews were most often conducted within two or three days of salient behavioral moments so that the incidents were fresh in the students' minds. During interview sessions, students were asked exclusively to view, analyze and explain their own classroom behaviors. Students were never asked to observe or analyze behaviors of other people in the class. The interviews were generally 20 to 25 minutes in length and occurred on school grounds at a time and location (such as the library or an unused classroom) that was sufficiently private and convenient for each particular student. All interviews were conducted during a free period, lunch period, immediately before school or immediately after school as each individual student's schedule allowed. Students never missed class time (neither this honors biology class nor any other class) to participate in interviews. During the few minutes before or after each honors biology class session, I discretely and briefly approached individual students and asked them to participate in an interview session. The student and I then communicated via email to compare schedules and set a specific time and

place for each interview. In this way, I tried to be extremely respectful of the brief time students have between classes and did not impinge on their very busy daily schedules. Finally, all student interviews were digitally audio recorded as not to intrude on the discussion by taking detailed field notes and to ensure that I captured exactly what each student said.

Each focus student participated in scheduled face-to-face interviews, informal discussions between classes, and brief clarifications via email. Kennedy was formally interviewed on three separate occasions while Owen and Mateo were each interviewed twice. In total, I accumulated 155 minutes of interview data across the three focal students which translated into approximately 40 minutes of interview data for Owen, 70 minutes of interview data for Kennedy and 45 minutes of interview data for Mateo. Additionally, seven other students in this classroom participated in a single interview which provided approximately 130 minutes of additional interview data. In total, I carried out 14 one-on-one, face-to-face interviews with various students and collected approximately 285 minutes of interview data.

In an effort to focus student attention and protect student privacy, I incorporated the use of “masks” during each showing of video segments. When participating students were invited to view segments of digital video, large sheets of cardboard with circle cut-outs were used to block out portions of the viewing screen and ultimately “mask” other students who appeared in the background. Only the desired portion of video appeared in the circle cut-out where it was then available to be viewed. These cardboard “masks” were prepared specifically for each segment of digital video that was used and was affixed to the viewing screen. These “masks” ultimately served two purposes; they allowed student participants to concentrate on their own behavior by removing possible background distractions in the

videos and they also protected the privacy of students who did not choose to participate in the research study.

Lastly, during the course of each interview, I incorporated informal member checking. Member checking is essentially a technique that strengthens validity and credibility by allowing study participants to confirm and/or challenge the completeness of the interview data (Altheide & Johnson, 1994). I frequently summarized the information gained through the interview process and allowed each individual student to comment on the accuracy and completeness of my interpretation. While this technique strengthens validity, it is also another way to demonstrate my ideological commitment to consideration of student voice.

Teacher Interviews

I formally interviewed the classroom teacher, Mrs. Jackson, at the beginning of this research study. This pre-study teacher interview focused on Mrs. Jackson's teaching philosophy and provided a greater understanding of classroom context, upcoming units of instruction, where content and pedagogy of the upcoming units were situated into the larger classroom context, and whether the observational period was reflective of usual teacher practice (see Appendix B). The interview was semi-structured with prompts to begin the discussion but flexible to allow Mrs. Jackson to reveal her thoughts, philosophies, and stories. The interview was approximately 60 minutes in length and was digitally audio recorded as not to intrude on the discussion by taking detailed field notes and to ensure that I captured exactly what the teacher participant said. I did not choose to carry out in-depth teacher interviews during the data collection phase because I did not want my research agenda to influence (either consciously or subconsciously) the usual means of classroom instruction. However, I did carry out brief 5 to 10 minute informal conversations with Mrs. Jackson on a

daily basis throughout the course of the study to understand her plans and goals for daily instruction. Acquiring an ongoing understanding of daily instructional choices was also served by collecting student handouts and by examining the materials posted on her course website. Additionally, I carried out a more substantive 20 minute informal interview with Mrs. Jackson at the end of this research study as a means of member checking. This follow-up interview was open with no predetermined discussion prompts. I broadly explained the conclusions I drew from the research data and asked for her general impressions given her unique perspective as the classroom teacher.

Data Analysis

Data analysis for this qualitative research study was situated within an interpretivist paradigm. Interpretivism is based on the notion that reality is socially constructed and that the purpose of research is to reflect understanding of a particular phenomenon within a particular context (Willis, 2007). I attempted to understand the phenomenon under study by uncovering the meanings that participants assign to them (Orlikowski & Baroudi, 1991). More specifically, I endeavored to understand student engagement within one secondary science classroom, as it was demonstrated and explained by the voices of three students. Figure 3.1 illustrates the process I followed to categorize and analyze my data.

As previously mentioned, data collection began by broadly observing all 26 student participants (“classroom specific” in Figure 3.1). Based on these observations I identified a spectrum of behaviors represented in this honors biology class. I then selected three focus students in an attempt to cover as much of this spectrum as possible. The focus students differed from one another in their behaviors but were largely representative of the behaviors

across students in the classroom. I then carried out in-depth observation of the verbal and nonverbal behaviors demonstrated by each focus student.

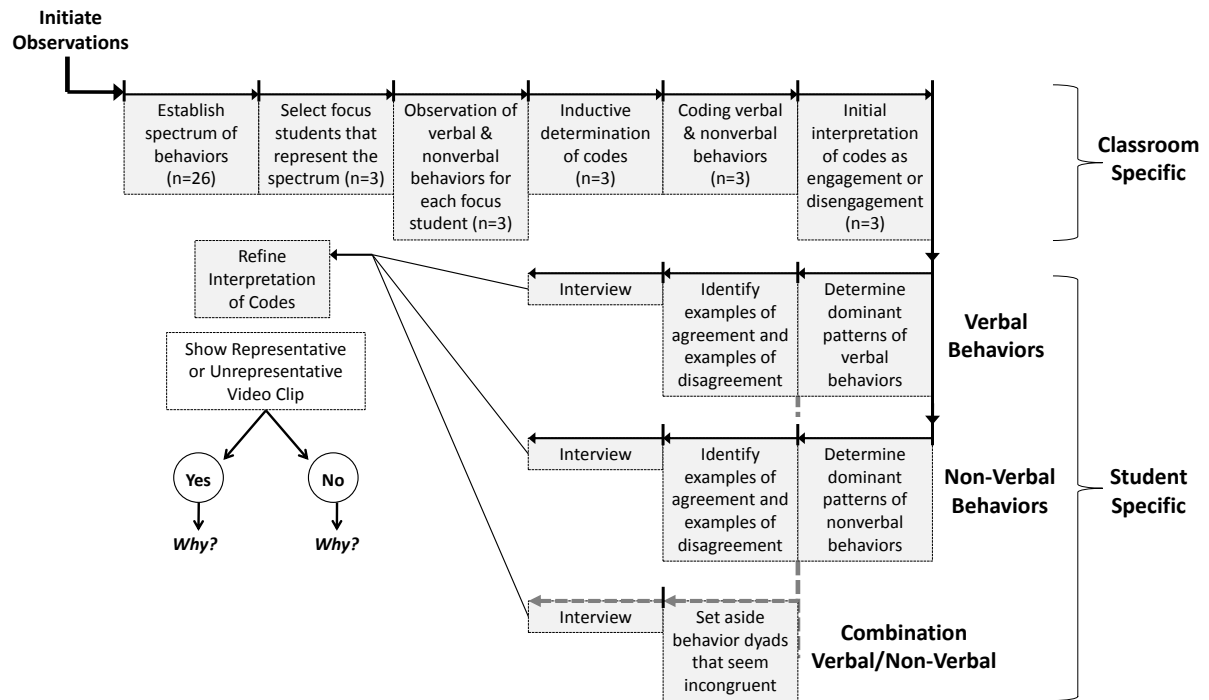


Figure 3.1: Data Analysis Process

Data analysis within an interpretivist qualitative study is ongoing; the researcher is guided by the data to focus and re-shape the study as it proceeds (Glesne, 1999). Referring back to my research questions, I repeatedly returned to the observational data (written field notes and digital videos) and viewed it with multiple lenses in order to identify codes and subcodes. My first research question seeks to understand the primary indicators of student engagement (verbal and nonverbal) within an inquiry-oriented high school biology classroom. Therefore, my first coding concentrated specifically on distinguishing student verbal behaviors. I identified two broad codes: “student questions” and “student comments” and then determined several subcodes under each of these headings based on my observations (see Appendix C). The data was then coded a second time to identify student nonverbal

behaviors, including “student actions” and “student gestures”. Related to these two broad categories, I identified several subcodes which characterized specific types of actions and gestures (see Appendix D). The specific codes and subcodes were developed according to a general inductive approach wherein my initial conclusions emerged from the patterns in the raw data. The data was not analyzed according to a predetermined set of codes. Once the data had been coded according to verbal and nonverbal behaviors, I initially interpreted each code and subcode as a demonstration of either “engagement” or “disengagement”. These initial interpretations were based on my familiarity with the existing research literature as well as my personal experiences as a classroom teacher.

After forming my initial interpretations, the next step was to look individually at each focus student to determine dominant patterns of behaviors (“student specific” in Figure 3.1). For example, I discovered that one pattern of behavior for Owen was that he frequently asked “information seeking” questions. I observed this behavior for him across multiple class periods, multiple topics of instruction, and multiple pedagogies.

To address my second research question regarding the meaning of behavioral indicators of engagement, I conducted student interviews. I began with concrete instances of behaviors, such as Owen’s “information seeking” questions, from my observational field notes and digital videos. I looked for classroom instances that were either in agreement or disagreement with this pattern. For example, I selected one video segment that showed Owen asking multiple “information seeking” questions and a second video segment wherein he asked very few of these types of questions. I then brought both of these incidents to Owen for discussion within an interview.

Interviews with students were essential for revealing the meanings and purposes behind student verbal and nonverbal behaviors and provided an opportunity to link back to observational and digital video data. Additionally, student interviews served as a member check, providing crucial information for assessing whether or not my initial interpretations of behaviors as examples of either engagement or disengagement were accurate. Within these interviews I began by presenting the focus student with a classroom scenario that I believed was representative of a pattern I had observed for him/her. For example, I showed Owen a video clip where he was asking “information seeking” questions and sought confirmation from him about my initial interpretation of this behavior as an example of classroom engagement. In instances when he disagreed with my interpretations, I probed with follow-up questions to discover why. I then presented him with a classroom scenario that was in disagreement with this pattern. For example, I also showed Owen a video segment where he was asking very few “information seeking” questions. Again, I asked him probing questions to determine if I accurately understood his behavior.

Whereas I identified patterns of verbal behaviors and patterns of nonverbal behaviors, I also came to recognize instances where verbal and nonverbal behaviors were incongruent with one another. For example, I identified an instance where Owen was asking multiple “information seeking” questions while simultaneously yawning, slouching, and fidgeting with his pen. I regarded these vocal behaviors as engagement and regarded the nonverbal behaviors as disengagement. This mismatch challenged me to make judgments concerning which behavior was more predictive. When I also brought these instances to students within interviews they helped reveal meanings and purposes behind these mismatched behaviors. Probing to understand the influences on verbal and nonverbal behaviors for the three focus

students allowed me an opportunity to better understand the distinguishing characteristics of their engagement (see Appendix D). Ultimately, I classified each focus student as a distinct type of engager: vocal, sporadic and silent. I describe the distinguishing characteristics of these categories of engagers in chapters five, six and seven.

Student Voice Operationalized

Theoretically, my data analysis was informed by the model of student voice. There are two central ideas that together provide the basis for how I conceptualized student voice within this research study. The first of these involves listening. Katherine Schultz (2003) describes listening as something more than simply hearing. She suggests that listening is an active process that “encompasses written words as well as those that are spoken, words that are whispered, those enacted in gesture, and those left unsaid” (p. 8). Listening to an individual student involves awareness of such things as how he/she chooses to physically participate, what captures his/her attention, his/her relationships with others, his/her successes and his/her failures. While listening certainly encompasses attention to oral participation in the classroom, it also involves awareness of student actions and attentiveness to moments of silence. Yet, perhaps most importantly, Schultz (2003) stresses that observation can be done from a distance while listening requires proximity and intimacy (p. 8). Listening requires individuals to “place students’ humanity alongside their own at the center of the classroom and curriculum” (Schultz, p. 35). This framework guided my research as I “listened” to both verbal and nonverbal demonstrations of behavioral engagement within this honors biology class. I actively and deliberately spent time comparing my written observations to digital videos to build a comprehensive picture of each of my focus students as behavioral engagers. Furthermore, in all of my interactions with

students, I actively tried to create an environment of collaboration and appreciation. I fully realized that my ability to conduct this research hinged on the students' willingness to use their voices and share thoughts and feelings with me. Furthermore, I respected moments of silence when students had no words, were unsure of words, or didn't want to use words to explain their behaviors; I did not push them to speak when they were uncomfortable doing so.

The second idea that provides a central basis for my notion of student voice within this research study is a definition set forth by Furman and Calabrese Barton (2006). The authors conceptualize student voice as having two distinct dimensions: (1) student perspectives and (2) student participation. The perspective dimension of student voice involves analyzing student talk during work, informal conversations, or interviews. The authors define student talk in a broad sense to include what students say, how they say it, and to whom they say it. Conversely, the participation dimension of student voice is viewed as "voice in action" (Furman & Calabrese Barton, 2006, p. 671) and describes how students choose to act within a learning environment. Participation involves attention to student choices in terms of what they do within a learning environment and how they do it. This framework guided my research in combination with the notion of listening as it draws attention to both the verbal and nonverbal aspects of behavior. Within my research study, I considered student talk according to both verbal and nonverbal forms of communication. Additionally, I concentrated not only on things students said, but also the context in which they were said. I explored the connections between the ways students voiced their perspectives and the ways they demonstrated these perspectives via their classroom participation.

Summary

In this chapter, I illustrated how this qualitative case study was designed according to the criteria of the classroom teacher, students and pedagogy. I described my teacher participant, Mrs. Jackson, as an expert teacher in a secondary science classroom who self-identifies a commitment to inquiry pedagogies and consistently demonstrates this philosophy in her instructional choices. Additionally, I described how students were invited to participate based on their enrollment in a single section of Mrs. Jackson's honors biology class. I also laid out the process whereby three focus students were chosen to deliberately cover the broad spectrum of demonstrated classroom behaviors. Furthermore, I revealed the ways in which I utilized observation, digital videos, student interviews and teacher interviews as multiple means of collecting data. I described how I analyzed this data according to an interpretivist paradigm that highlights the social and contextual nature of knowledge. This framework provided a means of data analysis in which student voices were valued and respected. I also described how I interpreted and reinterpreted student behaviors according to students' own explanations. In the next chapter I describe Mrs. Jackson's teaching philosophy and instructional goals. As this classroom teacher was purposefully selected based on the criteria of subject matter, years and experience, and pedagogical philosophy and implementation, her influence is a crucial piece to better understanding student engagement within this honors biology classroom.

CHAPTER FOUR

MRS. JACKSON

Introduction

Recruitment for this research study began with the teacher, as I sought to find an expert in the area of secondary science with a commitment to inquiry-oriented pedagogies. Based on existing literature which suggests that inquiry oriented pedagogies positively impact engagement (Tytler, et al., 2008, Russell et al., 2005; Driscoll, 2000), I hypothesized that the pedagogical decisions of the classroom teacher would have a significant effect on student engagement in this research study as well. Existing research further suggests that teacher support can affect students' behavioral, emotional and cognitive engagement. Skinner and Belmont (1993) found a reciprocal relationship between student engagement and teachers' behavior in classrooms where teacher involvement was positively correlated with students' behavioral and emotional engagement. In another study, researchers found emotional and cognitive implications that followed from a documented causal relationship between changes in perceived teacher support and the valuing of mathematics within middle school classrooms (Midgely et al., 1989). When teachers are responsive to student needs, students exhibit increased interest, effort, attentiveness, happiness, confidence, resiliency, and self-sufficiency, while demonstrating decreased anxiety, anger, boredom, disruptive behavior, and dropping out (Dunleavy & Milton, 2008; Yazzie-Mintz, 2007; Russell et al., 2005). In other words, positive student-teacher relationships can directly increase student engagement. Mrs. Jackson is an expert teacher who has a strong reputation among parents,

students and other educators for her responsiveness to student needs. Therefore, I hypothesized that her ongoing demonstration of student support would serve to impact student engagement in this honors biology classroom.

This chapter will describe the teaching philosophy and teaching methods of Mrs. Jackson, the teacher participant in this research study. I will discuss the ways in which she describes and defines student engagement as well as the ways that she may influence student engagement.

The Classroom

Mrs. Jackson's philosophy of teaching might be inferred by simply examining her classroom. Rows of student desks are loosely lined up in the center of the room facing the teacher desk, whiteboard and screen at the front of the room. A laptop computer and projector sit on a rolling cart in the middle of the room amidst the student desks. The room is encircled by nine oversized black laboratory tables upon which are perched large glass tanks: the majority of which contain snakes of various sizes and colors with fish and tarantellas also represented. Around the periphery of the room are mounted bookcases overflowing with books, videotapes, binders, papers and pamphlets as well as samples of animal antlers, teeth, bones and pellets. Colorful animal posters cover the white walls and are accompanied by larger-than-life models of butterflies, tree frogs, and spiders. Every surface is cluttered with the remnants of student projects that have survived through the years, including; hand-drawn posters and sculptures made out of styrofoam balls and modeling clay. Add to all of this dozens of stuffed animals and a row of unruly potted plants positioned along the windowsill. The scene might certainly be best described as "busy".

Mrs. Jackson's teaching style essentially matches the décor of her room. Nothing is overly structured. Nothing is too neatly packaged. While she is certainly organized and her daily instruction is well planned, there is much flexibility inherent in Mrs. Jackson's curriculum. Furthermore, Mrs. Jackson embraces the busyness and uses it to give students both choices and voices in her classroom.

Background

Mrs. Jackson is a Caucasian female on the verge of retirement. She is a wife, a mother, a grandmother and an active member of the science teaching community. Mrs. Jackson has been teaching at Lincoln High School for 26 years and has been teaching this honors biology class for the majority of that time.

Mrs. Jackson's honors biology course is an advanced level elective course in human biology that encompasses the entire school year. Students taking this course receive honors credits but are not eligible for advanced placement (AP) credits. The vast majority of students in the course are seniors who enrolled in honors biology to obtain their final credits in an upper level science. Three students in the course were sophomores who obtained special permission from Mrs. Jackson to take the course so that they could take AP biology during their junior or senior year².

Students in this honors biology course are exposed to such topics as biochemistry, genetics, evolution, anatomy and physiology. These topics are taught through lecture, group projects, laboratory activities, speakers, readings and field trips. During my eight weeks of observation, the content included tissues, DNA mutations, bioinformatics, meiosis, genetics, and disease. Additionally, I witnessed a wide array of pedagogical strategies as students participated in large group lecture, created meiosis dances, voiced their opinions in a

² While one of these students was selected for a single interview, none were selected as focus students.

classroom debate, manipulated laboratory equipment, carried out a computer simulation, and created online Wikipedia pages. The instructional activities of a representative week in this honors biology class are as follows:

Monday	Tuesday	Wednesday	Thursday	Friday
Paper Plasmids Activity	Bacterial Transformation Lab	Bacterial Transformation Lab	Biotechnology Powerpoint	Sanger Sequencing Activity

Table 4.1: Representative Week of Honors Biology Pedagogy

Within this research study, I have operationalized inquiry as “the creation of a classroom where students are engaged in essentially open-ended, student-centered, hands-on activities” (Colburn, 2000, p. 42), which aligns with Mrs. Jackson’s own definition of inquiry (see below). Three class periods in the representative week above are in line with this definition; the two-day bacterial transformation lab and the Sanger sequencing activity. These activities did have predetermined methodologies, yet they can be considered inquiry-oriented as students physically manipulated laboratory equipment, made predictions, gathered and interpreted data, and applied their findings to real world scenarios. In contrast, the paper plasmids activity and biotechnology Powerpoint represented traditional pedagogies as they were essentially teacher driven with predetermined methodologies and outcomes. This balance between inquiry-oriented and traditional pedagogies is representative of a typical week in this honors biology classroom.

Inquiry Pedagogies

Mrs. Jackson’s notion of inquiry pedagogies reflects a historical perspective that has changed over her many years as an educator:

So back when I was in Ed school it was all BSCS³ and its quote unquote inquiry teaching...it did mean some labs where kids were discovering rather than just doing, but it wasn't extreme discovery. Then you flip ahead to the constructivist era, which is throw materials at them and let them discover whatever it is they're going to discover. (laughs) Everybody was so hot for that and all along I kept thinking, 'How will that work actually?' We actually have a curriculum they have to learn.

Centered somewhere between these two extremes lies Mrs. Jackson's current philosophy of inquiry teaching which she sums up as "there has to be some balance." Mrs. Jackson describes this balance in terms of a computer simulation activity she recently conducted with her students. Students begin by predicting how an all white coat is inherited by cats and then they collect and analyze data which supports or refutes their predictions:

For example, I'm doing this activity called Cat Lab...and basically they create a hypothesis how do they think all white is inherited in cats? They tend to say recessive, not all of them, some say dominant, but they tend to say recessive for two reasons: it's rare and albinos are recessive. And that's good reasoning. And then when they collect their data...they get these interesting dilemmas where they mated two cats that are all white and they get some not all white kittens. And then they're just like, 'Well how do we do this?' In other words, I've got my hypothesis now how do I do this? And I say, 'well maybe you need to look at your hypothesis again.' So it's that kind of thing where I don't want to tell them but I will sequence some questions or I will say things like, 'Why don't you try it one way and see if it works. If it doesn't work, try it another way' giving them guidance as to the procedure they might use.

This Cat Lab activity was inquiry oriented as it challenged students to make hypotheses, collect data, and draw conclusions based on their data. Mrs. Jackson's approach to giving guidance without giving answers leads the students to think and struggle to find an answer on their own. However, this approach is in line with her philosophy of balance as she offers guidance and does not abandon the students to the point where they might give up.

Mrs. Jackson is acutely aware that inquiry pedagogies impact student engagement in her classroom:

Researcher: How do you think that the inquiry pedagogies that you use impact student engagement?

Mrs. Jackson: Oh, I think it definitely affects engagement!

Researcher: How?

³ The BSCS 5E instructional model is a teaching sequence that involves five distinct phases: engagement, exploration, explanation, elaboration and evaluation.

Mrs. Jackson: I'll give you an example. When I do my Powerpoints, you look around the room, ok. Engagement is different. There are kids who like that stuff but there are a lot of kids who are just like this (rolls her eyes). They are! They're cross-eyed! And part of me says they have to get used to some of that and I try to make them [the Powerpoints] as lively and interactive as I can. But on the other hand, when they're doing, they're engaging. Now here's the tricky part. If all I did was say do it, here's the questions, here's the materials, I don't think some of them are quite...they still need help with processing. So I will need to help them process. But that's ok. I mean, the activity is engaging. Now we have something real we've worked on, right? That they can now relate to.

This discussion with Mrs. Jackson reflects not only an awareness of the ways in which pedagogical choices affect student engagement, but also mirrors her aforementioned philosophy of balance. While she believes that her students best engage when they are active in the learning process, she also makes reference to their academic success outside of her classroom. She realizes that her interactive teaching style is not the norm, and she utilizes moments of lecture to both cater to students who excel with that mode of instruction and to prepare all students for situations where they must process information in a more passive role.

Mrs. Jackson's Definition of Student Engagement: "They're involved in the learning"

Mrs. Jackson assesses whether her students are engaged according to her personal definition of what student engagement is and what it looks like. In contrast to many existing studies of student engagement within the research literature, Mrs. Jackson does not consider student engagement in a one-dimensional way. She does describe how student's oral contributions serve as a key measure of student engagement:

Things that I like to see are kids who have some enthusiasm for what they're learning. And not all of them, believe me, get high enthusiasm, but you do see some of this just excitement! Like even with the epidemiology papers which I've just assigned, I've had a couple kids already going, 'Oh, Mrs. Jackson, there's this thing I really want to do!' To me, that's the best. Not, 'Oh my god, I've got to write a five page paper!' or 'I have this content hanging over me!' but 'I'm excited about this topic I'm going to get to do!' That's engagement to me.

Yet, she also notes that she is also able to pick up on the behavioral cues of her quieter students. She described ways in which she discerns engagement based on nonverbal student behaviors or as a combination of verbal and nonverbal behaviors:

Researcher: So what about your quieter students that aren't as comfortable being verbal or outwardly emotional?

Mrs. Jackson: I'm not sure! I mean, I think that (pauses), I think that it's harder to pick up on engagement in that case. But I do think just watching how they're involved in an activity or something can tell you.

Researcher: Can you elaborate on that?

Mrs. Jackson: So I think engagement can look like many things. Let's say you're just doing a typical Powerpoint kind of thing. Engagement can just be that kid who is making eye contact and you can tell they're really thinking about it, they're listening. Or they raise their hand and ask a question that connects to what you're saying, so ok, he's an engaged kid. So that's just typical I'm here at school and I'm with it and I have some interest in what you're talking about and I'm connecting it to stuff that I'm familiar with. But engagement could also be like if you're doing some activity, like if you're going out to the pond. Something a little bit more unusual. You see kids who are really excited about taking the Ph of the water and 'Let's go try this one! Let's see what the Ph is over here!' So they're maybe even extending beyond what you told them to do. But they're involved in the learning. So I do a lot of nonverbal looking at kids to see, do they appear to be there with me. And I think you can tell.

In these ways, Mrs. Jackson reads the verbal and nonverbal cues of student behaviors to assess engagement. Furthermore, Mrs. Jackson greatly values cognitive engagement as students take the initiative to be responsible for their own learning and demonstrate a willingness to work.

Yet, while engagement in the classroom is important to Mrs. Jackson, she also recognizes that there are some students who may not be behaviorally engaged in the material but who are able to cognitively engage in the material and hold themselves responsible for doing well in the course:

And so you see them [several boys] in class and you're like, 'They're not even focused'. But what they do is that they do it at night. You know they get into it or they get together and study. So again, that means that you're not as crazy worried about it in class because you see that they're doing what they need to do.

Therefore, in cases where Mrs. Jackson can determine cognitive engagement, she is willing to step back and not push students to behaviorally engage in ways that she might appreciate or expect. She realizes that learning is the ultimate goal no matter how each student might get there.

Additionally, Mrs. Jackson acknowledges that it is difficult always to recognize whether her students are engaged while they are in the classroom. However she has been fortunate to witness some of the choices of her former students as they move on with their lives after high school:

I'll tell you one of the other ones for me is the number of kids that have gone off from our school, there's just a pile of these kids going off and being Bio majors or science majors. Over and over and over again I've heard about kids. I just talked to a girl...who was telling me about all these kids that are now Bio[logy] focused from the Bio[logy] 2 [honors biology] class. Well, the question is do they come in already bio[logy] focused or is something turning? Now I've had parents say to me 'I never thought they would do this but here they are doing it'. So, you know, that's something! And that, I think, is engagement. To find out that they got something out of it when I hear about them later.

Mrs. Jackson realizes that student engagement is at times subtle or even impossible for her to recognize. Yet, when she hears that her former students were captivated and interested enough to pursue STEM knowledge and skills in the future, she feels as though she has succeeded in engaging them.

Impacting Student Engagement

Mrs. Jackson has a strong conviction that getting to know students on a personal level directly impacts their engagement within the classroom:

I definitely think, and everybody does it differently, but I think that having friendly, respectful but friendly exchanges with kids engages them in wanting to do your class. You know, they want to do ok in your class. I think how this plays out is I take kids into some pretty complex stuff and I don't think they even realize it sometimes, you know? It's like we're having a good time and we're learning and yet it's pretty complex...But I think that if I'm enthusiastic and if I'm encouraging and if I'm positively reinforcing the learning they're doing, then they surprise themselves, I think, at what they will do. And I'll give you an example of this. Occasionally I'll get a class that's just a bear to teach. There are kids in there that just drive you crazy. And I've always said if I can flip that and just get my mind set so that I really hold that kid in the light, I know it sounds a little hokey, but hold him in the light and say, 'I'm going to like you in spite of everything' you know? (laughs) 'And I'm going to work with you and I'm going to find a way that you can I can connect'. It may never be perfect. It probably won't be. But it will be a lot better than it could be...even though it may take some work up front, I'm still happier to have something going on with that kid.

Mrs. Jackson's conviction to know her students is easily observed and readily demonstrated on a daily basis. She initiates conversations with students every chance she gets. She strives to learn about their families and interests and talents. She attends students' plays and

concerts and athletic events. Mrs. Jackson also opens her personal life to her students by telling stories about her grandkids and recounting her weekend activities. She openly answers student questions regarding her own likes and dislikes. She greets her students as they enter the classroom and wishes them well as they leave. In these ways, she creates authentic relationships with students which she presumes to have an influence on their willingness to engage and succeed.

In connection with knowing a student comes knowing how to tailor instruction to meet the needs of that student. Mrs. Jackson talked about some of the challenges she faces when trying to engage students in honors biology:

I get concerned a little bit about this group of boys...because they can get off and they're into the sports and other stuff so quickly. And they're really nice guys too! They're sweet kids! So here's this tenuous...step on them how much? Too much you've lost them. They'll hate the class the rest of the year. And not enough and they're not engaged in the excitement. It's a tricky thing to play with.

I have frequently witnessed Mrs. Jackson ignore behavioral indicators of disengagement such as whispered conversations or even blatant sleeping. She tolerates levels of noise and commotion that are much above my personal comfort level as an observer. Instead, she embraces those students who do demonstrate behavioral engagement and is forgiving of the disengaged students, again seeking the balance she adheres to in her philosophy. While one might expect her tolerance to lead to greater displays of disengagement, the opposite is instead true. Her students frequently reorient themselves to engagement without her interference.

Summary

In this chapter I described the teaching philosophy and teaching methods of Mrs. Jackson, the teacher participant in this research study. I discussed the ways in which she describes and defines student engagement. Furthermore, I described how her personal and

instructional choices may greatly impact student engagement within her honors biology classroom. In the following chapters, I describe the engagement styles of three individual focus students. The focus students were selected according to my early observations of verbal and nonverbal behaviors; they reflect interesting examples of engagement and disengagement that were noticeably different from one to another.

CHAPTER FIVE

OWEN

Introduction

The first focus student in this research study is Owen. I will begin by describing Owen's typical classroom behaviors in two contexts: during a class session in which Mrs. Jackson utilizes a more traditional pedagogy and during a class session in which Mrs. Jackson utilizes an inquiry-oriented pedagogy. I will then discuss the similarities and differences in Owen's behaviors across these two contexts. Furthermore, I will discuss how and why I have classified Owen as a "vocal engager" within this honors biology class. Finally, I will describe the various factors that Owen describes as having influence over his classroom behaviors. This chapter merely serves to present information about Owen as an engager in Mrs. Jackson's honors biology class. In chapter eight, I will reflect on these findings and draw across all three focus students to illustrate similarities and differences in their ways of engaging.

Owen's Behavioral Engagement: Traditional Pedagogy

Owen enters Mrs. Jackson's classroom with a large red book bag slung over his shoulder and a big smile on his face. An avid lacrosse player on the high school team, today Owen carries his lacrosse stick into class, twirling it around in his hand. He makes a point to call out, "Hi, Mrs. Jackson" before heading to his seat in the right back corner of the classroom. At his desk, he throws his book bag on the floor, perches himself upon the back of his seat and easily strikes up conversations with several of the students sitting around him.

“Hey, Andy, nice suit! What time is the game tonight?” he calls out to his friend as Andy enters the class room a few moments later.

The rest of the students slowly filter into the classroom and the bell rings. As they get settled into their seats, Mrs. Jackson launches into a personal story about her grandkids and their experience on an airplane when they came to visit her over the weekend. “Ok, I’ve got you warmed up, right?” she teases as she wraps-up the story. Owen smiles and nods. Mrs. Jackson migrates to the back of the classroom as she solicits volunteers to present their genetics case studies⁴. Essian and Jonathan volunteer and move to the front of the room to present their case about Hemophilia. During their presentation Mrs. Jackson interrupts to ask a question of clarification. While her question is directed to the class as a whole, Owen takes the initiative to respond:

Mrs. Jackson: The female carrier does not have hemophilia. Does that make sense?

Owen: Because...because she...(thinking aloud)

Mrs. Jackson: She is a carrier but she doesn’t have any symptoms of hemophilia.

Owen: So why is that?

Mrs. Jackson: Because that one right there is an X little H, X big H, little D, little D. She is a carrier. She doesn’t have the disorder.

Owen: So to have hemophilia you have to have two little X’s...

Mrs. Jackson: (interrupts) For a female to have hemophilia.

Owen: Where with the male you must need one.

Mrs. Jackson: Good!

The group presentation then turns to the topic of polydactyly and Mrs. Jackson again steps in to mediate a conversation regarding the prevalence of this phenomenon. While her question is again addressed to the class as a whole, Owen is quick to offer the first response:

⁴ Students worked in small groups to solve case studies related to genetic crosses. Each group prepared an overhead transparency demonstrating how they solved their particular case study and presented this solution orally to the class.

Mrs. Jackson: It's a dominant trait, polydactyly. Why aren't there a bunch of people running around with extra fingers?

Owen: Because people don't want to mate with people who have polydactyly! It's Darwinism! (Mrs. Jackson and several members of the class laugh)

Mrs. Jackson: Say it again.

Owen: It's kind of mean, but people don't want to mate with people who have extra fingers!

Mrs. Jackson: I could care less if somebody had extra fingers. So big deal, they can hold the basketball better! (class laughs) You might be right, Owen. I'm just kidding. But that's not the reason.

Owen's comments regarding polydactyly noticeably charge the class and lead to much smiling, laughter, and whispered side conversations. Mrs. Jackson ignores these distractions and they quickly subside as the group resumes the presentation.

There is enough time remaining in the class period for a second group presentation so Seo-Young and Anna volunteer to present their case study about calico cats. At this point, Owen is beginning to lose some of his enthusiasm and focus: he begins yawning, pulling at his ear and hair, and looking around the room. Yet, when Mrs. Jackson asks a question about cat gender and color, Owen once again engages quickly in the conversation:

Mrs. Jackson: Do you all understand why they can't get any black female cats out of this cross?

Owen: (shakes his head no)

Mrs. Jackson: You're crossing a female who's XO, XB to a male who's XO, so to get a black female what do you have to have?

Owen: XB, XY?

Mrs. Jackson: That's a male. (several members of the class laugh at Owen)

Owen: I know, but if you get....uh... (flustered and confused)

Mrs. Jackson: To get a black female kitten you have to have two X's, each of them gets a B. So if I'm a calico what's the only way I can get a black kitten?

Owen: If the dad's black.

Mrs. Jackson: Right.

Owen looks around, smiles and good-naturedly whispers at his friends to “shut up.” Mrs. Jackson again ignores these minor distractions and instead focuses on the group that is presenting.

As the class period comes to a close, Mrs. Jackson calls out some last-minute instructions and reminders as the students collect their belongings. The bell rings and Owen makes his way to the door. “Bye, Mrs. Jackson. Have a good afternoon,” he calls as he playfully punches Andy in the shoulder, twirls his lacrosse stick and walks out the classroom door.

Owen’s Behavioral Engagement: Inquiry Pedagogy

Today, the class is being held in the computer lab rather than Mrs. Jackson’s classroom. Owen enters the computer lab right as the bell rings. He scans the room quickly for an open computer but sees that they have all been taken. Carson catches his eye, smiles and waves. Owen returns the smile and claims an empty chair next to Carson so they can share the computer.

Mrs. Jackson begins handing out sheets of paper to the students as she asks:

Mrs. Jackson: So, Ashton.

Ashton: Yes, ma’am.

Mrs. Jackson: Here’s what I want to know. How many of you went to the basketball game Friday night? (several students raise their hands) I know, because I saw a lot of you. Ok, so what I want to know is, the first half of the boys’ game was pretty neck and neck. After the half our team just squashed them. So, here’s what I want to know. What did coach say to you at halftime? (Ashton smiles)

Ashton explains how it was a positive pep talk to get them excited and get rid of their overconfidence. Mrs. Jones continues with this conversation as she finishes handing out papers.

Ok, guys, here’s the plan for today. I’m going to talk about this paper for a few minutes and then I’m going to move you into the next stage of our bioinformatics activity.

She directs them to a website that has been set up to mimic a real company. The students are responsible for using the website to conduct research about the DNA strands that they have previously collected and transcribed from their imaginary research subjects. Mrs. Jackson gives the students the go ahead to begin as they are ready. Within two minutes, Owen and Andy begin a side conversation about a triathlon which Mrs. Jackson overhears:

Mrs. Jackson: 2014?

Andy: I'm doing the Ironman competition then. (smiles)

Mrs. Jackson: Oh yes, that's when you're doing it? I'll come if I'm alive. (smiles)

Owen: You wouldn't even finish the first third! The swimming, you swim like 20 miles!

Carson: It's 2 miles! You swim 2 miles!

Owen: Then you get out and bike like...

Carson: You bike 12 miles.

Owen: Yeah, and then you run a marathon! It's true gut. Andy, I'm just saying you're too slow. (They all laugh)

Mrs. Jackson: Gentlemen! Research!

Owen glances over at Mrs. Jackson and nods in response, but still does not begin the activity. Instead he chats with Carson and Ashton about basketball and he uses the internet to show them a video of an NBA game and pull up player statistics. Mrs. Jackson is circulating within the computer lab talking with other groups of students. The room is loud as students work in pairs on the simulation activity. The noise and commotion causes Owen's behaviors to go unnoticed and unchallenged. Mrs. Jackson eventually circles around to Owen's group and realizes they are not participating in the activity.

Gentlemen, I have students who have already started activity three! You're not even close. Not even close.

Owen, Carson and Ashton exchange sheepish grins as they immediately pick up their worksheets and begin looking at their computer screens. They are silent as they begin

clicking through the website. Mrs. Jackson observes them for a few moments and highlights some of the data on their screens. Yet, when she leaves to answer another student's question Owen strikes up a new conversation with Carson, their papers discarded on the desk and their eyes averted from the computer screen.

“Vocal Engager”

The above scenarios are typical depictions of the ways in which Owen behaviorally engages in Mrs. Jackson's honors biology class. Based on my sustained observations of and discussions with Owen I have coined the term “vocal engager” as a way to classify his particular engagement style. When Owen is engaged, he is speaking. He rarely raises his hand to ask for permission to speak, but instead calls out questions, responses or statements as he sees fit. Furthermore, his speaking oftentimes overshadows other students in the class as he interrupts or talks over them. If another student has an opinion that Owen doesn't agree with, he freely speaks up to disagree. If Mrs. Jackson directs a question to the class as a whole, Owen is often the first person to call out an answer.

What does Owen's Behavioral Engagement and Disengagement Look Like?

Behavioral engagement within the classroom is commonly identified according to positive student conduct, effort, persistence, attention, asking questions, answering questions, and contributing to classroom discussion (Fredricks et al., 2004). Yet, Owen's behavioral engagement was markedly different depending on the pedagogy that was utilized. In this section, I will describe patterns in Owen's behavioral engagement in a traditional classroom setting and compare/contrast that to his patterns of engagement in an inquiry-oriented classroom setting.

Traditional Pedagogies

When Owen is behaviorally engaged in an interactive lecture, or large group discussion he is extremely vocal. The chart below shows the number of Owen's verbal contributions during various typical traditional pedagogies as observed via digital video recordings:

Span of Instructional Activity	Instructional Activity	Number of Verbal Contributions⁵
7 minutes	Entire class watching video of student meiosis dances	12
11 minutes	Student groups present findings of genetics case studies mediated by Mrs. Jackson	21
14 minutes	Lecture and large group discussion as introduction to class debate	26

Table 5.1: Owen's Verbal Contributions during Traditional Pedagogies

Owen answers Mrs. Jackson's questions, asks questions of clarification to Mrs. Jackson and his peers, and verbally contributes personal experiences and antidotes that connect to events occurring in his daily life. Owen does not tend to fluctuate between periods of engagement and periods of disengagement in rapid succession. Rather, his behavior is consistent over a significant stretch of time. I have repeatedly observed Owen sustain periods of engagement lasting 10 to 15 minutes, and occasionally stretch to as long as 20 minutes before he loses focus.

Owen's particular questions and comments often drive the classroom discussion. His verbal contributions often serve to solicit feedback from Mrs. Jackson or entice reactions from other students in the classroom. For example, during one class period, I observed Mrs. Jackson facilitate a class discussion as a wrap-up to a DNA activity they had done the day

⁵ Verbal Contributions were counted according to the codes and subcodes provided in Appendix C.

before. She prefaced this discussion by telling the students it would be a brief review and they would soon begin to organize a class debate:

Mrs. Jackson: You know, genome study has been amazingly confirming of the work that Darwin and others did on the theory of evolution.

Owen: Then how can people doubt that?

Mrs. Jackson: Oh, there's many ways people can doubt that. I'm not going to talk about that now but we will talk about that.

Michael: I didn't come from a monkey! (several other students in the class nod in agreement)

Mrs. Jackson: There is definitely the need for, deep respect for people who question. I mean that's ok.

Owen: I just mean that there's all of this genome study evidence now and stuff.

Mrs. Jackson: One of the best spokespeople I know is the author of our Bio[logy] book...he's the guy, he actually went up to Dover and testified in that trial. I think I told you guys about that didn't I?

Owen: (shakes his head no)

Jenna: In what trial?

Mrs. Jackson: Ok, long story, but interesting.

Although Mrs. Jackson maintained that she wanted to save this topic for another day, Owen's persistence and the reactions of his peers to his statements eventually changed the course of classroom discussion. Following this exchange Mrs. Jackson launched into a five minute detailed story involving the way a particular science textbook came under scrutiny for its treatment of evolution. While she had originally planned to quickly move on to the classroom debate, Mrs. Jackson instead embraced the students' curiosity and allowed the instruction to deviate from what she had originally planned in direct response to Owen's statements.

While it's noticeable when listening to classroom discourse that Owen is engaged in the conversation, there are also non-verbal indicators of his engagement. The one feature that is most telling in predicting whether or not Owen is engaged is attention to his eyes. When Owen is engaged his eyes are focused on each aspect of classroom action and he turns

his head to follow the flow of conversation and presentation of information. When he gets particularly energized about something his eyes suddenly widen and he sits up straighter in his desk, raising his hand or bursting out into a verbal statement or question. Additionally, Owen demonstrates engagement as he frequently laughs and smiles in response to Mrs. Jackson or his peers across topics related to the science content.

Conversely, when Owen is disengaged, he still speaks, yet often uses a different speaking tone or offers a diminished number of verbal contributions. During periods of disengagement his talk is directed to select peers seated nearby rather than toward Mrs. Jackson or the class as a whole. These verbal contributions are not in accordance with the science content and most often have to do with football, basketball or other sports. Owen's verbal disengagement occurs in the form of whispered conversations during traditional pedagogies, but is most noticeable during group projects or inquiry-oriented pedagogies where he is given large measures of autonomy. He openly disengages when he is with a small group of friends, laughing and talking across a range of topics unrelated to the daily instruction. Additionally, my observations of Owen's behavioral disengagement include physical gestures such as sleeping, drawing pictures, fidgeting with his pen or fingernails, and holding his head in his hands. His eyes are also very reliable in predicting disengagement. When Owen is disengaged, he does not actively track the classroom discussion and actions. Instead, he looks at his paper, at his desk out the window or at other students in the room, specifically those who are not talking. Furthermore, his disengagement greatly diminishes the number of the verbal questions and statements he makes. Because Owen's voice is an extremely prevalent component of the daily flow of the classroom, his

periods of disengagement in which he did not verbally participate were instantly noticeable to me as an observer.

Owen is aware that there are times during traditional lessons when he is disengaged. In response to a digital video segment I showed him where he was sleeping, staring out the window and drawing pictures in his notebook, Owen explained:

So when I get sidetracked or distracted I just do my own thing I guess. And I guess that's bad but, I mean, It's difficult to stay 100% in terms of being into everything all the time.

Sometimes “doing my own thing” manifests itself as withdrawing, becoming silent, and displaying behaviors that do not align with classroom instruction. Other times “doing my own thing” is reflected as Owen initiates whispered off-task conversations with the people sitting around him. In this way, his disengagement not only affects his own learning, but oftentimes serves to distract and influence the engagement of others.

There are also times when Owen seeks to redirect his disengagement back to engagement. During a teacher-directed test review, Owen was visibly struggling to stay awake. His chin was resting in his hands and his head was periodically nodding as his eyes fluttered closed:

Owen: Can I use the restroom?

Mrs. Jones: You too? (another student had the same request five minutes earlier)

Owen: I need some water to...

Michael: (teasing) Yeah, you need to go to the restroom or get a drink or anything to get out of the room.

Owen: I'm tired man!

Michael: Why are you so tired?

Owen: Because I was up until 11 doing homework.

Mrs. Jackson: Go, go. (gestures him out of the room)

Owen left the classroom but returned less than two minutes later. When he returned his behavior was quite different as he made a conscious effort to write on his study guide and verbally answer Mrs. Jackson's questions. In this way, Owen took control of his own disengagement and made a conscious effort to instead become engaged.

Inquiry Pedagogies

Each and every inquiry activity I witnessed over a period of eight weeks was accomplished in small groups. For Owen, this group dynamic did not serve to enhance his engagement. Rather than using class time to complete group activities and projects, Owen instead talks, laughs and jokes with his friends about topics unrelated to the biology content. For example, during one class session students were asked to complete a laboratory activity where they cut, transcribed and taped paper DNA strands to find two ways of constructing a plasmid. Mrs. Jackson challenged the students to find both "a simple solution" and "an elegant solution" wherein the plasmid varied in size. As students broke into groups and began working, I observed Owen, Evan and Carson loudly talking and laughing about Virginia Tech football, their materials discarded on the laboratory table. Mrs. Jackson recognized their misguided conversation from across the room and intervened:

Mrs. Jackson: Gentlemen, are you transcribing?

Evan: Kind of.

Mrs. Jackson: From Virginia Tech? (laughs)

Owen: Sorry. (laughs)

Owen and his group picked up their materials after this reprimand and begin physically participating in the activity while still carrying on the same conversation. After several minutes, there was a loud burst of laughter from their group which once again drew Mrs. Jackson's attention and prompted her to assert, "Gentlemen! I didn't know bioinformatics

was so much fun!” Owen was unable to sustain engagement for more than two or three minutes at a stretch during this activity and was by and large disengaged for a period of 35 minutes. This is in stark contrast to his engagement in traditional pedagogies which regularly lasts 10 to 15 minutes at a stretch. It seems that Owen is unwilling or unable to sustain engagement during inquiry-oriented pedagogies for the same lengths of time that are possible during traditional pedagogies.

Faking it

Owen fluctuates between being behaviorally engaged and behaviorally disengaged. Furthermore, I have shown how his engagement varies depending on the pedagogical approach. Yet, there is a third category that also merits examination: faking engagement. Owen readily admits that there are times when he pretends to be engaged in class when he really is not:

Researcher: So for me to just sit there and look at you, how would I know whether or not you’re engaged if you’re not speaking?

Owen: (long breath out) That’s difficult because kids know how to look engaged without being engaged.

Researcher: Do you ever do that? Do you act engaged when you’re not?

Owen. Yeah, all the time!

While these instances may not be immediately apparent to a casual observer, Owen’s behavioral indicators of faking engagement became quite transparent as I observed him over an extended period of time. When Owen is pretending to be engaged he looks up at the teacher during random moments that are not obviously related to content or shift in topic or shift in activity. He also inserts “uh-huh” comments or nods his head in relation to Mrs. Jackson’s comments that are oddly timed and do not fit with his overall posture and demeanor. For instance he may draw a picture steadily for 5 or 10 minutes without looking

up from his paper and then randomly look at Mrs. Jackson and say “uh-huh” or “yeah” in response to something she is saying. When Owen fakes engagement, he at times verbally contributes, but his comments are noticeably diminished in terms of complexity and depth:

Mrs. Jackson: Remember, they all had an oxygen with each carbon?

Owen: (looks up from his drawing) Yeah, oxygen and carbon.

Mrs. Jackson: Which means...?

Owen : (shrugs and goes back to his drawing)

Rather than synthesizing information into an insightful response or connecting the information to a broader personal experience as evidenced in some of the above examples, Owen simply repeats the knowledge Mrs. Jackson has already shared. This is markedly different from his verbal contributions during periods of engagement.

Owen did not attest to faking it during inquiry-oriented classroom activities nor did he describe ways in which students might fake it in these setting. This is not to say that he is always engaged with inquiry-oriented pedagogies; in fact he regularly disengages during these types of activities. However, he is either engaged or disengaged without deliberate attempts to fake engagement.

What Influences Owen to be a Vocal Engager

Owen makes daily decisions regarding how he will choose to participate in Mrs. Jackson’s honors biology class. These behavioral decisions are greatly influenced by his emotional engagement and cognitive engagement. Emotional engagement within the classroom is commonly identified according to students’ feelings toward teachers, peers, and school in general. Emotional engagement is reflected in students’ feelings of belonging at school and it is presumed to influence the willingness to authentically engage in school work (Finn, 1989; Fredricks, 2004). Cognitive engagement within the classroom is commonly

identified according to mental and physical investment in learning, goals for academic achievement and self-regulation of learning (Reschly & Christenson, 2006; Appleton et al., 2006; Fredricks, 2004). Emotional engagement and cognitive engagement are both intimately related to behavioral engagement, and are not isolated processes to be considered alone. Instead, it is important to examine the “antecedents and consequences of behavior, emotion, and cognition simultaneously and dynamically, to test for additive or interactive effects” (Fredricks et al, 2004, p. 61).

Owen’s Emotional Engagement: “When you let your guard down and talk to people”

Owen is an extremely social person. He prides himself on his relationships with his friends and his deliberate efforts to be a good person to those around him. In fact, this dedication to interpersonal relationships is reflected in his personal definition of student engagement itself:

High school’s a very insecure time, I think, for most people. So I think that one’s self-confidence really has, well not only self-confidence but how they feel about themselves or how they view their peers or how they think that their peers view them, really has something to do with how many people act....So I feel that it’s, it really comes down to like where you feel secure. So I guess student engagement really has to do with that, like when you let your guard down and talk to people...

His definition highlights how a willingness to engage is directly impacted by how students view their peers, how they view themselves, and how they think their peers view them. Thus, in Owen’s view, engagement is mediated by a student’s level of self-confidence and level of comfort in interactions with his/her peers. This is demonstrated in Owen’s own behaviors as he is very gregarious and confident in his relationships with other students in the class.

Owen verbally engages on a regular basis because he feels secure that his peers respect him and comfortable in the ways they will react to him. Yet, even though Owen has high levels of self-confidence, he is not immune from self-doubt. He explains that there are limits to the extent to which he is comfortable orally participating:

Researcher: It really struck my attention that when your group went up to present that you started the presentation but...when you started to present it in a certain way and she [Mrs. Jackson] had suggestions for how you guys should have represented your data differently you let...

Owen: John.

Researcher: Yeah, John took over the entire rest of the presentation.

Owen: Right. Well, I mean, that particular activity I didn't work...like that was the week that I had to do college apps and so I didn't know as much about that and John knew everything about that so I kind of let him take over. But I usually know what we're talking about. That's why I'm usually pretty vocal in class because I know. But especially when I don't know very much about a certain subject I'm not as vocal because then I'll say something that isn't true. Or it makes me sound stupid.

Owen was sick and absent from school while other students in his group were preparing for this presentation. Therefore, his lack of preparation caused him to doubt himself. For Owen, the fear of saying something would make him "sound stupid" created a barrier to engagement that he was admittedly unwilling to cross.

In conjunction to his relationships with his peers, Owen described how his emotional engagement is affected by his relationship with Mrs. Jackson:

The teacher has a lot to do with being engaged too. Mrs. Jackson does a good job of being (pause) like, (pause) I really like her class...Mrs. Jackson she's just a really nice person. She's a good person, which I think really helps.

The mutual respect between Owen and Mrs. Jackson is evident. The two exchange lighthearted banter on a daily basis across the subject matter as well as across their personal lives; Owen asks Mrs. Jackson about her weekend activities and her grandkids while she in turn asks him about things such as his college plans and lacrosse games. When I showed Owen a video segment depicting a rare confrontation between Mrs. Jackson and him regarding scheduling of a make-up test, he admitted:

I know that Mrs. Jackson was a little bit irked by the situation, which I mean, she doesn't show it, but that bothers me, like, if my teachers are upset with me.

This relationship seems to provide motivation for Owen to be engaged within Mrs. Jackson's classroom. Even though Mrs. Jackson didn't outwardly display her feelings regarding this

confrontation, Owen interpreted her feelings as anger and disappointment. It bothered him that he felt like he had created this tension and ultimately let her down.

Sometimes it is not the influence of either peers or the classroom teacher that affects Owen's behaviors but the two in combination. The following description illustrates how a particular classroom incident affected Owen's level of behavioral engagement:

Mrs. Jackson: Um, excuse me! Where are you going, Owen? [Owen collected his belongings ten minutes into the class period and started to walk out the door]

Owen: I have to do that shoe thing with Andy.

Mrs. Jackson: (sighs) Oh.

Owen: Why is there always hate?!

Mrs. Jackson: No, this is not hate. This is just confusion because I always...

Owen: Last week I was sick for two days and then yesterday I went home before the game...

Mrs. Jackson: But Owen! Owen! Monday? Can we sort of count on Monday [to make up a test]?

Owen: Yes! For sure.

Mrs. Jackson: Good. I'll email you and remind you.

Owen: It's like today I got a call from my coach last night saying I'm not going to get into college unless I get all this stuff in that Mr. Vincent hasn't seen yet...

Mrs. Jackson: No, that's good. I understand that, but do talk to me once in awhile when that happens.

Owen: (Nods and sighs and bows his head. Leaves the room only to return a few short minutes later)

Mrs. Jackson: We're glad to have you back.

Owen: Yeah, right. Whatever.

Michael: We missed you! (smiling)

Mrs. Jackson: Why are you back?

Owen: (sighs) It's a long story. (class laughs) Basically it's Andy, you know Andy. He was like 'Oh, yeah Owen you have to come to this SGA [Student Government Association] meeting' after Mr. Morris told me I didn't have to come...and then he [Mr. Morris] comes up and Andy was like 'I didn't tell you to come' and it's like Andy, come on man! (class laughs again as Owen sits down)

Mrs. Jackson: Well the good news is that we're glad to have you back.

Owen: Yeah, it's just this kind of stuff always happens to me. It's just like...

Michael: You messed up. (smiles)

Owen: I didn't mess up, alright! (class laughs) Michael, don't say that!

Mrs. Jackson: Alright! Refocus!

Following this incident, Owen was extremely disengaged. He held his head in his hands and eventually put it down on his desk for several minutes. Additionally, he did not make a single verbal contribution during the 30 minutes remaining in the class period. When I showed Owen a video clip of this moment and asked him to explain what he was thinking and feeling he conveyed how his own frustrations greatly affect his mood and his willingness to engage:

I guess I have ups and downs like when something doesn't really go my way or like I'm frustrated with something it definitely translates over into my activities. Like for another example, in lacrosse whenever I make a mistake I guess I mope about that and it's something that I'm trying to work on.... Things that happen on a day-to-day basis can affect your engagement level because, like that day [referring to a video clip I showed him] I was really frustrated...and so I just kind of zoned out...

In general, Owen's emotional engagement drives his behaviors as he seeks to control how others perceive him. In this case, he was visibly upset that he had upset Mrs. Jackson and evoked teasing by his peer. Ultimately, his behavioral engagement was not driven by self desires but rather by the expectations of others. Therefore, while Owen does have high level of self confidence, he also feels pressures to make certain choices and behave in particular ways as mediated by his peers and his teacher.

Owen's Cognitive Engagement: "You have to know when to turn it on and off"

Owen's cognitive engagement with this honors biology class can be recognized by his effort and persistence both inside and outside of the honors biology classroom. Cognitive engagement is not something that can necessarily be directly observed within a classroom setting. It is not possible to look at a student and definitively know if he/she is participating in correlation with personal academic goals or if he/she is seeking out challenges. However,

the effects of Owen's personal accountability can be discerned based on his often thoughtful classroom comments and questions that demonstrate preparation and understanding:

Mrs. Jackson: What is the value of this technology? [creating and using plasmids] What are we able to do that is so important for human health?

Owen: Trick bacteria?

Mrs. Jackson: Well trick bacteria into taking an engineered plasmid. What is the value in that?

Owen: Well, it helps produce medicine.

Mrs. Jackson: Yes, but what is the value of that?

Owen: We can grow it.

Mrs. Jackson: Grow it?

Owen: Grow bacteria? Am I just throwing stuff out there? (laughs)

Mrs. Jackson: Yes, you are throwing stuff out there, but we'll get there eventually. (laughs)

While Owen was uncertain of the answer to Mrs. Jackson's question, he effectively tried to think through the problem aloud by applying his existing knowledge to the new content. In this way he demonstrated a mental investment in learning. He did not simply repeat something back that he had already learned. Rather, he exerted effort to go beyond what he already knew.

Owen's cognitive engagement can also be demonstrated by his self-identified investment in learning:

There are days when you just don't care because you can do stuff at home. That's what I feel like a lot of teachers don't understand, that like, for me, in Mrs. Jackson's class it's hard for me to concentrate all the time but I get my stuff done at home. I've got an A+ in the class so, like, you know I get my stuff done at home. You just have to know when to turn it on and off. Like when you're at home you have to get off Facebook or whatever and open up the book or get on her [Mrs. Jackson's] website.

While Owen acknowledges that there are times when he struggles to sustain engagement, he recognizes the importance of being personally accountable. When Owen feels that his learning is diminished due to his disengagement, he takes steps to gain this knowledge and takes personal responsibility for his own learning.

Owen's cognitive engagement is also contingent upon the difficulty and relevance of the content that is presented:

Owen: I know all this stuff sounds pretty bad, but most high school students aren't that engaged within any of their classes.

Researcher: You don't think so?

Owen: No.

Researcher: Why?

Owen: Why should they care about what the theorem for, like pi squared, how to find the diameter of a triangle or a circle? They don't feel like they're ever going to use that!...Like, I waste so much time at home on like Facebook and stuff...and I can still get by with minimal work. Which I'm not saying is a good thing but for me, you know...I can still get good grades without putting out the effort that a lot of the kids do to get those grades. So I don't know if that's because I'm 'special' (makes quotes in the air with his fingers) or what but it just is what it is.

Owen is less willing to exert cognitive effort when he feels that the material is not challenging. When he finds the content to be too easy, he is more willing to coast on his natural talent rather than exerting deliberate mental effort. Additionally, he is less willing to exert cognitive effort where there is not a clear future benefit for engaging in select material. While Owen's future area of study in college is still undetermined, he does not anticipate that he will pursue a degree in a science related field. Owen described that "both of my parents are doctors...so I kind of have this 'I don't really like biology' attitude." While he does assert that he enjoys this particular class, he sees it as an opportunity to get a good grade that will help him get into college rather than as something more long term that he will use on a consistent basis.

Intangibles

I have described several ways in which Owen's emotional and cognitive engagement relate to his classroom behaviors. However, there are some additional factors outside of these categories that Owen also relates to his level of behavioral engagement. Owen

described how physical needs, most notably hunger and sleep, have an effect on his engagement:

And then days that you're tired or, you know, you haven't eaten lunch, you're too full. So like, there's different (pauses) there's lots [that impacts engagement].

Similarly, Owen points to a possible medical obstacle to his own engagement:

For all my classes I can't concentrate. I don't know if I have mild ADD [Attention Deficit Disorder] or what, but I just can't concentrate all the time.

While Owen may be genuinely willing to engage, immediate physical needs often overshadow this willingness and exert strong influence over his ability to do so.

Summary

In this chapter, I introduced Owen as a student with a particular way of engaging within Mrs. Jackson's Honors Biology classroom. I classified Owen as a "vocal engager" and I described what this looked like in terms of his classroom behaviors. I then described several facets of his emotional and cognitive engagement that directly influence his willingness to behaviorally engage. Additionally, I identified intangible factors which Owen claimed to be barriers to his engagement. In the next chapter, I will introduce Kennedy, a second focus student with a different way of engaging in Mrs. Jackson's honors biology class.

CHAPTER SIX

KENNEDY

Introduction

The second focus student in this research study is Kennedy. I will begin by describing Kennedy's typical classroom behaviors in two contexts: during a class session in which Mrs. Jackson utilizes a more traditional pedagogy and during a class session in which Mrs. Jackson utilizes an inquiry-oriented pedagogy. I will then discuss the similarities and differences in Kennedy's behaviors across these two contexts. Furthermore, I will discuss how and why I have classified Kennedy as a "sporadic engager/disengager" within this honors biology class. Finally, I will describe the various factors that Kennedy describes as having influence over her classroom behaviors. This chapter merely serves to present information about Kennedy as an engager in Mrs. Jackson's honors biology class. In chapter eight, I will reflect on these findings and draw across all three focus students to illustrate similarities and differences in their ways of engaging.

Kennedy's Behavioral Engagement: Traditional Pedagogy

Kennedy enters Mrs. Jackson's classroom carrying a large black binder and a reusable water bottle. Her seat is in the front row directly in front of the classroom door. She meanders to her seat slowly looking around to see who else has arrived and checking whether or not anything is written on the board. Kennedy shyly smiles and says hello to Anna in the seat behind her. She then sits down and begins unpacking her belongings as the

other students arrive. Her demeanor is not unfriendly, but definitely guarded. She flashes an occasional smile or wave as students arrive but doesn't offer any verbal greetings.

As the bell rings Mrs. Jackson hands out a study guide and quickly launches into a review for the upcoming test. Kennedy looks at Mrs. Jackson with her chin resting in her hand. She glances down at her study guide and begins doodling a picture of a star in the margin. However, Kennedy's head quickly snaps up as Mrs. Jackson displays a small apparatus filled with purple liquid and asserts:

Mrs. Jackson: Look I can make water boil just by holding it? How come that's boiling?

Michael: Because you've got a battery powered heater in the bottom of your hand. (students laugh)

Mrs. Jackson: There's one hypothesis (laughs)

Mrs. Jackson walks past Kennedy to turn off the light and then moves to the projector in the middle of the classroom to begin an interactive Powerpoint lecture that builds on the demonstration she just made. As the light goes off, Kennedy slumps back into her chair and yawns. She zips her binder closed and puts it on the floor and then leans over her review sheet with a sigh. She rubs her eyes and scratches her shoulder before glancing up at the presentation on the screen at the front of the room. She then turns and stares out the door for several minutes at some unknown activity taking place in the hallway. Another glance at the screen and Kennedy begins picking at her fingernails. She soon leans forward, puts her chin in her hand and stares at the presentation for several minutes before reaching down to retrieve her binder yet again. She opens it to a blank sheet of notebook paper, yawns, writes two or three sentences and then focuses her attention back out to the hallway.

As Mrs. Jackson launches into a discussion of autosomal inheritance, Kennedy glances at the screen and begins writing on her notebook paper. And writing. And writing. As it turns out, it's not writing at all, but rather drawing.

Mrs. Jackson shifts the discussion to the topic of breast cancer and once again Kennedy suddenly looks up. She turns her body to look back at Mrs. Jackson for the first time today and then she looks intently at the diagram on the screen.

Mrs Jackson: Another type of thing like that is something called NoE2, it's found in chromosome one. And in 41% of breast and ovarian cancers the protein being transcribed by this gene is not expressed. And this protein is probably a tumor suppressor. If you don't produce the protein that is supposed to suppress tumors you can't suppress tumors and you get cancers. But it happens if the people get both genes from the mother. Then the gene is not expressed and the cancer risk is greater.

Kennedy: (spontaneously calls out) So, is there a way for like them to test for that?

Mrs. Jackson: Yeah, they can test for it. Yeah. They look for markers.

Kennedy: Because I remember a while ago there was some celebrity, I don't know if this was it, but somehow she got tested for the probability of having like breast cancer and it said yes, and she had...had...

Mrs. Jackson: She had both of her breasts removed?

Kennedy: Yeah.

Mrs. Jackson: BRCA is the most well know breast cancer gene, different from this, and it only accounts for about 5% of breast cancers but if you inherit the gene your likelihood of getting cancer is extremely high. If you have maternal relatives who have had early breast cancers they almost always check for that gene. Truthfully, getting the breasts removed is probably the most relieving thing for those women because they can stop worrying so much about getting those breast cancers. And who needs them anyways. (class laughter) When you reach my age it's not that important. Your age, a little bit more. (class laughter)

Kennedy continues to focus on Mrs. Jackson and the presentation for several moments following this exchange and she hastily writes several lines of notes in her binder. She then resumes her drawing. Kennedy sits back, sighs, crosses her arms and takes a drink from her water bottle. Kennedy leans forward and begins fidgeting with her pen. Kennedy leans back and looks out into the hallway. She glances at the screen and resumes her drawing.

Mrs. Jackson turns to the topic of gene expression and Kennedy again sits up suddenly and turns her body to face where Mrs. Jackson is standing:

Mrs. Jackson: There is a kind of multiple sclerosis that won't get expressed unless you have been exposed to the EB [Epstein-Barr] virus. So it means if it's 50% penetrant, you'll see this on genes, it means that 50% of people that have it express it.

Kennedy: So basically it's like when you have a gene that could be expressed but you do things to like encourage it...

Mrs. Jackson: You may not even know you're doing it! In fact, whatever it is that triggers that gene it's not had that, been exposed to that.

Kennedy: So it's...

Mrs. Jackson: Hello! Hello back here! (trying to quiet the loud side conversations)

Kennedy: (looks back down at her drawing and drops her line of questioning)

Mrs. Jackson is still speaking as students begin packing up their belongings. There is a loud rustle of papers, coats and zippers. The bell rings and many students quickly exit the classroom. Kennedy yawns, slowly zips her binder and puts away her pen. She glances up at several of her classmates as they walk by but does not take the initiative to interact with any of them. The room clears and Kennedy is the last person to walk out the door.

Kennedy's Behavioral Engagement: Inquiry Pedagogy

Today the students will perform a laboratory simulation centering on genes that are involved in lung cancer. Mrs. Jackson begins with a brief discussion of the activity. As she instructs the students to break into groups and begin the activity, she tells them, "I will be here to help but I want you to do the work and the thinking!"

Kennedy gravitates toward Anna and Paige; these three girls often choose to work together in group situations. They move to the closest lab table. Anna begins reading the procedure for preparing six wet slides aloud while Kennedy physically handles the materials. Kennedy labels each of the slides and then carries them over to the water bath area. Anna and Paige follow. Drops of different liquid solutions must be placed onto each of the slides. Kennedy hands Paige the slides and instructs her to "hold these" as she finds the appropriate solution, measures it, and uses a dropper to place it on a slide. Kennedy repeats this for each of the six slides as Anna and Paige assist her.

The group moves back to their lab table as they must wait for the liquids to dry. Kennedy laughs and smiles as she converses with the girls about Anna's new shoes. She glances down at the slides and then surveys the room. She then walks away from the group to look at the fish in the tank at the end of the lab bench. After a few moments she walks back checks on the slides again. She bounces her knees and drums on her legs, fidgeting as she waits. Since the slides are still not dry, she pulls up a chair and joins in a conversation about a recently released movie.

After several minutes, the slides are dry and Anna explains that they must now "wash" the slides with a hybridization solution. Kennedy nods and picks up two of the slides. She carries them to a separate lab bench as Anna and Paige follow with the remaining slides. Kennedy drops the new solution onto each of the six slides while she correctly explains "she [Mrs. Jackson] said that we only need to use two drops of this." The group then stores their slides in preparation for continuation of the experiment tomorrow.

"Sporadic Engager"

The above scenario is a typical depiction of the ways in which Kennedy behaviorally engages in Mrs. Jackson's Honors Biology class. Based on my sustained observations of and discussions with Kennedy, I have coined the term "sporadic engager" as a way to classify her particular engagement style. Student engagement naturally fluctuates between periods of deep engagement, shallow engagement or disengagement and it can vary in intensity and duration (Fredericks, 2004). For Kennedy, this fluctuation is rapid. Kennedy has extreme difficulty focusing on any one activity for an extended period of time. Kennedy darts between periods of engagement and disengagement in such rapid succession that it's almost exhausting to watch. Furthermore, she never seems to fully commit to being entirely

engaged or entirely disengaged. She is not enthusiastic nor is she apathetic. Rather, her behavior is quite measured and she does not go to the extremes in either direction.

What does Kennedy's Behavioral Engagement and Disengagement Look Like?

Behavioral engagement within the classroom is commonly identified according to positive student conduct, effort, persistence, attention, asking questions, answering questions, and contributing to classroom discussion (Fredricks et al., 2004). Yet, Kennedy's behavioral engagement is notably different depending on the pedagogy that is utilized. In this section I will describe patterns in Kennedy's behavioral engagement in a traditional classroom setting and compare/contrast that to her patterns of engagement in an inquiry-oriented classroom setting.

Traditional Pedagogies

When Kennedy is behaviorally engaged in an interactive lecture or large group discussion she takes notes and inserts occasional well-thought-out comments or questions regarding the topic of instruction. Kennedy most often raises her hand to ask a question or make a comment, and does not call out answers or speak over others. Therefore, her comments and questions generally come during periods of silence or transition. Kennedy does not contribute constantly but usually speaks aloud once or twice during each class period. Her questions and comments are mainly for her personal knowledge as she describes, "I'm the kind of person who, when I need to know something, I'll just ask." Furthermore, her vocal contributions do not usually drive the classroom discussion:

Mrs. Jackson: We always tease bald men that they are really virile because they're bald, right? That's the joke related to the fact that testosterone causes that to be dominant in men.

Kennedy: So would something like Klinefelters [Syndrome] also affect...like, would that change how...

Mrs. Jackson: Oh, that is an awesome question! And my bet is yes! My bet is that if they inherited those baldness genes they would not be expressed as much unless they got the testosterone treatment. Great question!

Kennedy: If...(begins to speak but the room is suddenly noisy as students begin talking amongst themselves)

Mrs. Jackson: How are we doing on time? Is that is?

Kennedy: (looks down and begins gathering up her belongings)

In this instance, Mrs. Jackson was enthusiastic in answering Kennedy's question and had high praise for her thoughtfulness. However, the flow of discussion did not continue because Kennedy was not persistent in asking additional questions or offering additional comments when she had to compete with her classmates to be heard.

Conversely, my personal observations of Kennedy's behavioral disengagement include her drawing pictures, fidgeting with her pen or fingernails, and looking out into the hallway. Yet she drifts between engagement and disengagement in such rapid succession that it is oftentimes difficult to keep up. Kennedy acknowledges that she has trouble looking at Powerpoint slides with lots of text because they are difficult for her to process. Therefore, she tends to look away and just listen to the classroom discussion instead. Therefore, many times Kennedy may be displaying behavioral disengagement, such as fidgeting with her pen, while she is actually mentally investing in the content and cognitively engaging.

Inquiry Pedagogies

Kennedy's behavioral engagement is much more sustained (although still sporadic) when she is actively doing something rather than passively listening. I have observed her sustain engagement during inquiry oriented activities for 5 to 8 minutes at a time, which is in stark contrast to her rapid behavioral fluctuations during traditional pedagogies. While she is not extremely vocal in group situations, either in the form of questions or comments, she physically takes the lead in searching for information and manipulating the laboratory

materials. As described in the above scenario, when the pedagogy affords opportunities for bodily participation, Kennedy eagerly contributes. Kennedy describes her drive to physically participate in classroom activities:

I often just, when it comes to group work I just take over...because there are some people who can just coast along in terms of labs and class work and they get really good grades on tests...and then there's people like me who maybe aren't as good on the tests so like I work hard at the lab work because of that.

Kennedy realizes that she has difficulty engaging in traditional pedagogies so she actively strives to compensate for this by working hard and engaging in laboratory activities. The opportunity for physical participation in inquiry-oriented classroom activities provides an avenue for Kennedy to comfortably and successfully engage in ways that traditional pedagogies do not.

Faking It

Kennedy admits that there are certain classroom situations where she fakes engagement:

Researcher: Are there ever times when you're in class that you act like you're engaged but you're not?

Kennedy: Um, not so much in this class because this class is right after lunch and I'm in the front row. But, I mean, in some classes I do that.

Researcher: So what does that look like? What do you do if you want somebody to think you're engaged but you're not really engaged?

Kennedy: I do a lot of writing but it's not usually like I'm fake writing. But I'll draw or something and it will look like I'm working and I'll, you know, look up and I'll nod and stuff. But usually it's not like 'Ha, ha I'm going to lie to my teacher.'

Researcher: So why pretend to be engaged and not just...

Kennedy: Because a lot of teachers will call you out if they think you're not engaged and I don't really want to be called out. (laughs)

Because Kennedy doesn't verbally participate in classroom discussion on a regular basis, her voice is not noticeably absent when she pretends to be engaged. Furthermore, her nonverbal behavior is sporadic enough that moments of engagement and moments of faking

engagement look much like one another. Drawing from my personal observations and digital videos, I was able to pick out times when she was writing text and times when she was drawing pictures. Behaviorally, they looked exactly the same. Ultimately, Kennedy is quite successful at faking engagement in ways that are not conspicuous to an observer.

What Influences Kennedy to be a Sporadic Engager

Kennedy makes daily decisions regarding how she will choose to participate in Mrs. Jackson's honors biology class. These behavioral decisions are greatly influenced by her emotional engagement and cognitive engagement.

Kennedy's Emotional Engagement: "I don't come across the way people expect"

Kennedy is quite reserved in social situations and I noticed several instances where her engagement was impacted by her peers. For instance, during one class session Mrs. Jackson instructed the students to create a group dance that represented the process of meiosis. The students were given one full class period to develop and practice their dances before performing them to the rest of the class. I asked Kennedy about her engagement in this particular activity:

Researcher: Tell me about the class activities. What about when you guys did the meiosis dances?

Kennedy: (laughing) That would be a bad example [of engagement] because no one else in my group was interested.

Researcher: So were you interested or not so much?

Kennedy: I was in the beginning and then I realized that if I got too interested I would be the only person doing the work...and it was the week after *Rent* [high school musical production that she was a part of] and I just wasn't in the mood.

Rather than act on her initial feelings of interest and excitement regarding the meiosis dance, Kennedy resigned herself to a much shallower state of engagement due to the influence of her peers. She was engaged in the activity but ultimately masked this engagement and took a much more passive stance because she didn't want to be the only one who was interested and

she didn't want to do all of the work. Kennedy also described how her peers affect her engagement when I asked her about her involvement in a DNA laboratory activity:

Researcher: So does the ways that your peers respond to you, when you ask a question or make a comment or do something, does that have any influence on your engagement?

Kennedy: Not usually in Powerpoints and stuff like that, but in terms of lab things where I have to work more directly with other people it does because...I'm (pauses)...it's not that I'm shy but I'm just not very good at, like, getting to know people. And I don't (pauses)...I don't always come across the way people expect me to I think. So sometimes I will say or not say things in labs or in group projects depending on who I'm working with and how I think they will react.

Small group settings provide a much more intimate atmosphere that can sometimes be uncomfortable for Kennedy. Because she self-identifies a difficulty forming relationships with her peers, Kennedy oftentimes lets her predictions of peer reactions drive her behavioral engagement. In more traditional pedagogies, Kennedy's statements and questions are most often directed at Mrs. Jackson and her interactions with peers are essentially mediated by Mrs. Jackson. In small groups where Kennedy is given more autonomy over these peer interactions, her group members have a significant effect on her participation. For instance, When works with her friends, as described in the above scenario with Anna and Paige, she readily engages. Yet, when she is assigned to a group with people she does not know as well, interactions become awkward for her and therefore causes her to measure her behaviors.

Kennedy's relationship with Mrs. Jackson also seems to impact her engagement within this honors biology class. Kennedy does not often initiate interactions with Mrs. Jackson on a personal level, yet Mrs. Jackson frequently seeks out Kennedy. During my second week of classroom observation, Kennedy came to class with bubblegum pink hair:

Mrs. Jackson: I'm telling you all, I am tired. I'm not functioning at my best. I'm so tired that when I look at this hair it looks pink. (walks over to Kennedy and smiles at her)

Kennedy: (smiles and looks down at her paper. Seems pleased but a little bit embarrassed to be in the spotlight)

Mrs. Jackson: I like it. I really do!

Kennedy: Thank you.

Mrs. Jackson: And why did you do it?

Kennedy: Just for a change.

Mrs. Jackson: And how long does it stay in?

Kennedy: It depends on how well you take care of it.

Mrs. Jackson: My granddaughters are planning on visiting sometime either today or tomorrow and I hope they come in during this class because they are going to want pink hair. (they both smile)

The fact that Mrs. Jackson makes a conscious effort to personally connect with each student is not lost on Kennedy:

Researcher: Tell me about your relationship with Mrs. Jackson.

Kennedy: I like her a lot! She's really helpful!...Like I think what happens is that she's unfortunately stuck in this situation where she really likes teaching us more practical things but then it comes to, she has to teach. We have to be graded on tests because of the way the school system is...And I don't really think that's her fault, but, um, I think in terms of labs and stuff though she's really helpful. And even when it's something like 'I should know this. I'm just dumb,' if I ask her she will explain it and she, like, helped me with my, like, epidemiology project we had to do. She helped me figure out how to set up a survey and stuff like that. I like her!

Researcher: Is it easy for you to go up and talk to her?

Kennedy: I mean...I'm pretty comfortable with her. Like, she doesn't ever make me feel stupid or anything which is good. She's fairly nonjudgmental as far as teachers go. (laughs) Like, not to say that they're all judgmental but there's always a little bit of judgment that goes on.

The fact that Kennedy stresses Mrs. Jackson's nonjudgmental nature seems quite significant considering her bubblegum pink hair. Her pink hair is an expression of her individuality that Mrs. Jackson not only tolerates but openly celebrates. The fact that Mrs. Jackson doesn't make Kennedy "feel stupid or anything" gives her the confidence to ask questions and seek out help when she struggles. She is able to interact with Mrs. Jackson without fear of judgment.

Kennedy's Cognitive Engagement: "Focusing really hard, which I'm not very good at"

Kennedy's personal definition of student engagement is cognitively oriented:

Kennedy: I feel bad when I'm not engaged because I feel like a good student is always engaged!

Researcher: So what is engaged? What does engagement mean to you? How do you define it?

Kennedy: Hmmm...Like, being, like interested in what's going on and, like, focusing really hard on it...which I'm not very good at. (laughs)

Rather than defining student engagement in terms of behavioral activities, Kennedy's definition demonstrates her feelings about the importance of being invested in learning. Yet this definition is interesting given her self-analysis that "focusing really hard" is something which she's "not very good at." Kennedy doesn't categorize herself as a "good student" because she is not able to effectively sustain this mental engagement. Yet, in reality, Kennedy self-reports that she currently has a B+ in the course. While her grade reflects success, she perceives herself as a bad student because she struggles to "focus" and behave in ways that she thinks a good student should.

While Kennedy acknowledges a difficulty sustaining mental engagement for long periods of time, she also describes her commitment to learning outside of classroom instruction:

Kennedy: And then I'll be like, well I'll just download the Powerpoint from the website.

Researcher: Do you do that a lot? Go back to her [Mrs. Jackson] Powerpoints on your own time?

Kennedy. I definitely did it on the tissue one and a little bit on the one before that. I'm probably going to do it on this one.

Researcher: Ok. Just to give yourself more time?

Kennedy: Yeah. To learn it better.

This personal accountability for learning and success in this honors biology class is ultimately a demonstration of cognitive engagement in itself. Kennedy realizes that there are limits to her ability to remain engaged in the classroom. Rather than giving up or ignoring the content, she takes responsibility for learning and holds herself accountable. In this way, her self-regulation and work outside the classroom helps Kennedy overcome the engagement difficulties she frequently encounters.

Intangibles

As I previously asserted, there are numerous factors that come into play on a daily basis, both in and outside of the classroom, that can have a direct influence on student engagement. For Kennedy, one of the most important factors is her Attention Deficit Disorder (ADD). Kennedy does not take medication to help with the symptoms of ADD because “when they put me on meds, it gave me a high so I can’t be on meds for ADD.” Therefore, Powerpoint slides with lots of text and the fast pace of classroom instruction make it difficult for Kennedy to understand and process the science content. In these incidents she often stops exerting the necessary mental effort and takes a break until she can jump back into the flow of the classroom.

There are also physical factors that impact Kennedy’s engagement. One such factor is exhaustion. Kennedy explained the influence of sleep deprivation on her ability to stay engaged:

I know that the day we were doing the DNA replication was the day I was falling asleep because...like I had stayed up until two the night before doing homework. (groans)

This time spent engaging in academic work at home actually affects Kennedy’s cognitive and behavioral engagement in the classroom. Similarly, Kennedy pointed to sickness as a factor impacting her engagement:

I was so sick that day! [In response to a video segment she was watching] I’m still making up work from being gone those three days. I was so sick that I was just fed up with everything...I tend to have trouble just listening anyway and so when she was just sort of talking and I wasn’t feeling well I was just kind of like, ‘ugggggggggg, I’ll just read the directions later’.

While Kennedy may have the determination to engage, these physical limitations are at times too much to overcome.

Another factor affecting Kennedy's level of engagement is the flow of classroom instruction back and forth between inquiry and traditional pedagogies. She described how the daily variations in pedagogy are difficult for her to synthesize:

I like science and I'm interested in it... [but] this class is an interesting format that I've never had before and I think I just need to get into the swing of things, which is where we do a Powerpoint and then we just do labs. And so sometimes I have trouble sort of like doing the labs and connecting that to the book information that we need for the test.

Kennedy she has trouble connecting the more practical applications of the content, which are frequently accentuated during inquiry activities, to the structured, factual material in the textbook. This impacts her engagement as she tries to balance physical involvement with her concern over performing well on more traditional assessments.

Summary

In this chapter, I introduced Kennedy as a student with a particular way of engaging within Mrs. Jackson's Honors Biology classroom. I classified Kennedy as a "sporadic engager" and I described what this looked like in terms of her classroom behaviors. I then described several facets of her emotional and cognitive engagement, which directly influence her willingness to behaviorally engage. Additionally, I identified intangible factors which Kennedy claimed to be barriers to her engagement. In the next chapter I will introduce Mateo, a third focus student with a different way of engaging in Mrs. Jackson's honors biology class.

CHAPTER SEVEN

MATEO

Introduction

The third focus student in this research study is Mateo. I will begin by describing Mateo's typical classroom behaviors in two contexts: during a class session in which Mrs. Jackson utilizes a more traditional pedagogy and during a class session in which Mrs. Jackson utilizes an inquiry-oriented pedagogy. I will then discuss the similarities and differences in Mateo's behaviors across these two contexts. Furthermore, I will discuss how and why I have classified Mateo as a "silent engager" within this honors biology class. Finally, I will describe the various factors that Mateo describes as having influence over his classroom behaviors. This chapter merely serves to present information about Mateo as an engager in Mrs. Jackson's honors biology class. In chapter eight, I will reflect on these findings and draw across all three focus students to illustrate similarities and differences in their ways of engaging.

Mateo's Behavioral Engagement: Traditional Pedagogy

Mateo enters Mrs. Jackson's classroom carrying a small navy book bag and walks straight to his desk. He sits in the back left corner of the room; the very last seat in the very last row. Although several students have already arrived, Mateo does not acknowledge any of them. He drops his bag on the floor, slumps down into his chair and begins chewing on his fingernails. Mateo's eyes scan the classroom as the rest of the students arrive, never

focusing on any one thing or one person too long. He seems determined to stay as inconspicuous as possible.

As the bell rings, Mrs. Jackson launches into a story about her grandkids:

Mrs. Jackson: And then I had to read ‘The Ten Good Things About Barney’. Any of you ever read that?

Eu-meh: I’ve read that one!

Mrs. Jackson: Because a big tragedy happened two days ago. Fluffy dies. Fluffy was a hamster. Now the thing is he was almost two years old. You know how long hamsters usually live? Just about two years. (several students laugh)...So ‘The Ten Good Things About Barney’ is about a boy whose’ cat dies and they have a big burial and his dad tells him to think of ten good things about Barney they can say...So we’re trying to process the great loss of Fluffy. (students smile and chuckle)

Throughout this story, Mateo remains slumped in his chair. He does not react with laughter or smiles like many of his classmates. His arms are crossed over his chest but his eyes are focused directly upon Mrs. Jackson as she speaks.

Mrs. Jackson moves to the projector in the center of the room and informs the students that she will begin with a Powerpoint about DNA structure and function which “has a lot of animations and stuff in it.” Several students groan. Mateo watches as Mrs. Jackson moves to the projector but does not change his posture or facial expression.

As Mrs. Jackson talks, Mateo looks back and forth from her to the screen at the front of the room. He sits forward, props his elbows on his desk, and begins chewing on his pen. Mateo glances down at his notebook and strains to see what Avish is writing at the desk next to him. Mateo then picks up his pen and quickly writes something in his notebook. He then slouches back and looks back at the screen at the front of the room.

As Mrs. Jackson is speaking, there are whispered conversations that become increasingly noticeable. Mrs. Jackson swiftly addresses these:

Mrs. Jackson: So what is the advantage, David, of this procedure? (David is carrying on a whispered conversation with Avish)

David: I don’t know.

Mrs. Jackson: Say it again?

David: I don't know.

Mrs. Jackson: Ok, focus! How about you Mateo? Do you have any idea what the advantage of this procedure would be?

Mateo: (shrugs his shoulders and looks at Mrs. Jackson but does not answer)

Mrs. Jackson: Anyone know?

There is no change in Mateo's demeanor following this exchange with Mrs. Jackson. He continues to look forward and watch but makes no move to participate, either verbally or nonverbally. No nodding. No writing. No raising his hand. No calling out answers. Just a passively reclined posture with unwavering eyes focused on Mrs. Jackson.

The class draws to a close and several students begin noisily packing up their belongings. Mrs. Jackson continues speaking over this commotion until the bell eventually rings. Mateo closes his notebook and hastily stuffs it under his arm. Without a word or a backwards glance he picks up his book bag and walks out of the classroom door.

Mateo's Behavioral Engagement: Inquiry Pedagogy

Today, the students are performing a bacterial transformation laboratory activity. After some very brief introductory statements, Mrs. Jackson instructs the students to get into groups of four or five and move to the lab benches. As several of the students scramble to work with their friends, Mateo hangs back in his seat. He eventually walks over to the lab bench closest to him and joins a group of four girls. Seo-Young reads the instructions aloud to the rest of the group as Anna begins opening vials and measuring various liquids. Mateo shoves his hands into the pockets of his oversized red sweatshirt and watches. He occasionally smiles at comments that they make but he does not make any moves to physically participate and does not verbally contribute to the conversation.

The second step of the experiment involves immersing the test tube in a hot water bath at a station on the far side of the room. Seo-Young and Anna carry the tube across the room and Mateo follows them. He hangs around by the water bath station for several moments taking notice of the temperature of the thermometer and location of the test tubes before he rejoins his group. The group must now wait 10 minutes before they can proceed. Mateo pulls his cell phone out of his pocket and volunteers to keep track of time.

During the 10 minute wait, Mrs. Jackson calls for attention so she can explain how to perform the final steps. Mateo pulls up a stool and sits next to the lab bench. His legs are bouncing up and down and his eyes are casually scanning the room. He stops to look at Mrs. Jackson for a few moments and then looks down and begins manipulating his cell phone. He throws a tiny piece of paper at Seo-Young and mouths, “time’s up” as Mrs. Jackson continues to talk. Seo-Young nods and quietly walks across the room to retrieve their vial from the water bath.

Mrs. Jackson finishes speaking as the other groups in the classroom also resume the experimental procedure. Mateo stands and again watches as his group members perform the next steps. As they are still working when the bell rings so Seo-Young and Anna volunteer to stay after class to finish the experiment. Mateo nods in agreement, gathers his belongings and quickly exits the classroom.

“Silent Engager”

The above scenarios are a typical depiction of the ways in which Mateo behaviorally engages in Mrs. Jackson’s Honors Biology class. Based on my sustained observations of and discussions with Mateo I have coined the term “silent engager” as a way to classify his particular engagement style. This style was perhaps the most challenging of the three focus

students for me to distinguish and describe as an observer. Mateo's behavioral engagement is essentially nondescript much of the time. He makes few verbal contributions and equally few gestures to suggest engagement. Conversely, he does not mirror the disengaged behaviors of his peers in terms of off-task conversations, sleeping or drawing. While he does sometimes slouch and fidget, this most often coincides with sustained eye contact and attention to the instructional activity that is taking place. By most behavioral accounts Mateo would likely be labeled as apathetic or, even worse, as incompetent and his behaviors would be judged as disengaged. However, after much observation and interviews with Mateo I found that under his unwavering exterior lies a quiet, internalized form of engagement.

What does Mateo's Behavioral Engagement and Disengagement Look Like?

Behavioral engagement within the classroom is commonly identified according to positive student conduct, effort, persistence, attention, asking questions, answering questions, and contributing to classroom discussion (Fredricks et al., 2004). Yet, Mateo did not consistently mirror any of these commonly accepted behaviors. Furthermore, there was very little variability in Mateo's verbal and nonverbal behaviors in connection to the pedagogy that is utilized. In contrast to the behavioral indicators displayed by both Owen and Kennedy, there is very little variability in Mateo's patterns of behavior from day to day or even from minute to minute. Therefore, I will describe patterns in Mateo's behavior that are uniformly observed across both traditional and inquiry-oriented classroom settings.

It is extremely difficult to rely on verbal or physical behaviors to ascertain whether Mateo is engaged or disengaged as there is very little variability in Mateo's patterns of behavior from minute to minute or even from day to day. In order for me to better

understand Mateo's level of engagement, I had to heavily rely on information he chose to reveal in our one-on-one interviews:

Researcher: So the reason I wanted to interview you is because you're a mystery to me! I'm never quite sure how much you're engaged or how much you're not...if you're totally into what's going on or if you're not. You're a hard one to read just by watching you! So if you're engaged in the classroom, how would I look at you and know it?

Mateo: (laughs) Um...I guess just by looking at the teacher and just trying to figure out what she's saying and trying to comprehend it in my head and stuff like that.

Researcher: So does that change if you're disengaged?

Mateo: (laughs) Um...well...I guess it's not that different.

Mateo is aware that he is not noticeably behaviorally engaged and he acknowledges that an observer (or his teacher) might struggle to determine whether or not he is paying attention. In this way Mateo confirmed my analysis that his daily behaviors are very stable.

One aspect of Mateo's behavior that is atypical compared with his peers is note taking. During some traditional class sessions Mateo writes almost nothing. During other class sessions he writes a lot. Other students in this honors biology classroom described that their note taking is limited because they rely on the notes posted on Mrs. Jackson's website rather than writing their own. Therefore, other students are consistent in the few notes they write. Yet, Mateo's note taking is different because it greatly varies from day to day. I asked him about how writing notes correlates to his engagement:

Researcher: What other things do you do when you're engaged? Do you take a lot of notes? Do you write a lot when you're engaged?

Mateo: Writing notes is very helpful for me so I can look over it. I have to go over stuff so I can study it as well.

Researcher: If you're engaged in what's going on do you feel like you write more?

Mateo: If I'm really into what's going on I feel like I can remember it better, but if I'm not getting what's happening I write more.

Researcher: So if you're engaged you don't tend to write as many notes?

Mateo: Yeah...I guess. Like, sometimes in class things are, like, really slow and, you know, not a lot of people are paying attention. Those are the times when I have to try and take notes. But if it's more of an exciting class, when she shows the videos and stuff like that, I remember it better.

Researcher: So are you saying that when you feel it's more exciting you don't feel like you have to write as much?

Mateo: Yeah, because I can remember it better.

This revelation came as a complete surprise to me as an observer. Whereas I interpreted note taking an indicator of behavioral engagement, Mateo informed me that he actually *does not* write notes when he is engaged. Rather, he writes when he is disengaged and striving to stay cognitively connected. This was something that I was unable to predict by simply observing his behaviors.

Over the first half of my observation period, I had not seen Mateo verbally participate in class unless he was directly called upon, and even then not necessarily so. Therefore, at the end of my observation period I was surprised to hear Mateo spontaneously call out a correct answer during a class activity involving DNA point mutations:

Mrs. Jackson: So you've got those numbers? Somebody read those numbers back in order please.

Mateo: 0, 20, 2, 0, 1, 0.

Mrs. Jackson: Alright, did you get those down? Now we're going to strand three. (Mrs. Jackson has students raise their hands again to represent the number of mutations represented on their DNA strand) Ok, we got it? Mateo, will you read off the numbers again?

Mateo : We got 14, 2, 3, 4, 5, 5.

This was a significant event because it was an extremely uncharacteristic display of Mateo's behavioral engagement within this honors biology classroom. In fact, it was the first time I'd ever heard Mateo volunteer to speak in a large group class setting. I asked him about his reasons for verbally participating during this particular class session:

Researcher: That really caught my attention because I'd never heard you just volunteer. I mean, big time step up and volunteer the information.

Mateo: Yeah, yeah. (nodding and smiling)

Researcher: So why? What was special about this day?

Mateo: I'm not sure there was anything special about that day.... Well, usually when we talk about, well stuff we learn in science, sometimes I feel like I know it but I guess I don't take the chance trying to get the answer wrong or something like that. Like I said, I'm not sure if anything was different that day.

Researcher: Yeah, but clearly you took a chance. So did you just feel like you really knew it that day then? Like you took the chance because...why?

Mateo: It was a definite answer though! She [Mrs. Jackson] was looking for something that was for sure.

Researcher: So what if she asked for your opinion on something? Do you think you'd be less likely to offer an answer?

Mateo: If I was asked my opinion I would give my opinion. But if, like, regarding something like, like with science, not if it has a definite answer and I'm not 100% sure of it.

In this incidence, Mateo revealed that he reserves his verbal comments for situations where he is certain he will not provide a wrong answer. While he is not bothered by the idea of sharing his opinions, the possibility of providing a wrong answer to a question involving factual information is outside of his comfort zone.

Faking It

In contrast to Owen and Kennedy who both discussed that they fake engagement within this honors biology classroom, Mateo did not affirm that he pretends to be engaged when he really isn't:

Researcher: So in [honors biology] class do you ever act like you're paying attention or act like you're working when you're really not?

Mateo: Um, I wouldn't say that. Like, there was one time when I wasn't paying attention when we were watching a movie but only because I already saw the movie in biology, the one with tay-sachs...I saw that one in biology like sophomore year. But, like, I try my hardest to pay attention because I don't know that much stuff in the other [biology] classes we have.

While Mateo describes that he is at times disengaged, he asserts that he tries his hardest to pay attention and does not pretend to be engaged when he really isn't. However, because Mateo's classroom behaviors are quite nondescript and consistent, I have observed that he can effectively switch between periods of engagement or disengagement without it being

behaviorally obvious. While he may not intentionally fake engagement, he is essentially able to disengage without being noticed. When I went back to examine my digital video from the class period when the students watched the aforementioned tay-sachs movie, I was unable to spot any glaring behaviors that would suggest that Mateo was behaviorally disengaged even though he admitted as much.

What Influences Mateo to be a Silent Engager

Mateo makes daily decisions regarding how he will choose to participate in Mrs. Jackson's honors biology class. These behavioral decisions are greatly influenced by his emotional engagement and cognitive engagement.

Mateo's Emotional Engagement: "I don't think I'm embarrassed right now"

Mateo is a high school senior and this is his first year attending Lincoln High School. Therefore, relationships with both his peers and his teacher seem to have a significant effect on his level of engagement and the ways in which he chooses to behaviorally demonstrate his engagement. For instance, Mateo described previously mentioned scenario where he uncharacteristically called out an answer in class:

Mateo: I guess at the beginning of the year I would not have done that because I didn't know that many people in the class, but I know the majority of the classroom now.

Researcher: So, are you still uncomfortable speaking up in this class or ever embarrassed?

Mateo: I don't think I'm embarrassed right now. Like, I know everybody in the classroom and I feel more confident with them.

Researcher: How do people react when you speak up? Does that influence whether or not you do it?

Mateo: Um, I don't think they have a shocked reaction really. I've had a one-on-one conversation with just about everyone in the classroom now except maybe a handful of students, so I don't think it's that they're shocked when I talk...I don't feel like it's...it doesn't make...(long pause, laughs) Um, how do I say this? It's not like shyness or anything like that, that's not the reason I'm holding back or anything.

Researcher: Ok, so let me see if this is right then. It's not so much a matter of how other kids in the class react to what you say anymore but you said that sometimes you don't want to take a chance on being wrong?

Mateo: Yeah. Right!

Researcher: So it has more to do with Mrs. Jackson's perception of what you have to say instead of the students around you?

Mateo: Yeah, yeah, yeah. (nodding) Yeah, that's it.

Mateo's revelation that he feels comfortable with his classmates was surprising to me given that I rarely witnessed him interacting with them. His comfort with his classmates was behaviorally imperceptible to me as an observer. It's not that he appears significantly comfortable or uncomfortable, but rather indifferent. Yet, while he currently does not feel that his peers influence his behaviors, he does say that he's not "embarrassed right now" and he feels "more confident" with his peers. This suggests that Mateo's peers may have influenced his behaviors earlier in the school year when he came to Lincoln High as a new student, prompting him to choose not to call out as he did in the example included earlier.

Mateo's revelation about the importance of Mrs. Jackson's perception of him was also surprising to me. I had never seen him take the initiative in the classroom to start a conversation with Mrs. Jackson. However, the week following this interview, I did witness Mateo uncharacteristically initiate a conversation with Mrs. Jackson during a class session in the computer lab:

Mateo: Mrs. Jackson, would you say that I have an accent?

David: He's got a little one.

Mrs. Jackson: I would say slightly but I'm not sure what it is. Are your parents from Spain?

Mateo: My parents are Dominican.

Mrs. Jackson: Oh, ok, so you're not Spanish.

Mateo: I *am* Spanish!

Mrs. Jackson: You are Spanish?

Mateo: Yes.

Lucy: He's Hispanic.

Mrs. Jackson: But Dominica...

Mateo: The Dominican is Spanish.

Mrs. Jackson: Dominica is Spanish?

Mateo: The Dominican Republic.

Mrs. Jackson: That's considered Spain?

David: No, no, not Spain. He speaks Spanish.

Mateo: People speak Spanish in the Dominican Republic.

Mrs. Jackson: No, I understand you *speak* Spanish, but being Spanish means you're from Spain.

Mateo: Oh, ok, yeah. I'm Hispanic. (smiles)

Mrs. Jackson: Well, I always knew you were Hispanic, I mean, your name is Mateo _____. (laughs)

Mateo: (laughs)

Mrs. Jackson: Is your native language English?

Mateo: Yeah. I speak English and I speak Spanish. My parents speak Spanish.

Mrs. Jackson: So you speak Spanish at home a lot.

Mateo: Not since I live here. I live with my brother so I speak English now.

Mrs. Jackson: What did you learn as a baby?

Mateo: I guess English and Spanish.

Mrs. Jackson: Your English is perfect.

Lucy: I wouldn't say perfect. (teasing)

Mrs. Jackson: Accents are tricky though.

In this incidence, Mateo not only initiated the conversation with Mrs. Jackson, but he openly shared information about his personal life outside of the honors biology classroom. I felt that this conversation was significant as it provided Mrs. Jackson with some previously unknown context regarding Mateo's background and current life situation. It also provided Mateo with some reassurance that he could safely and comfortably speak to his teacher. Notably, this conversation took place during a noisy class session in the computer lab where students were working on a bioinformatics activity in small groups. This side conversation was largely

unnoticed by Mateo's peers other than his own group. This informal setting seemed to provide the confidence for Mateo to approach Mrs. Jackson.

Cognitive Engagement: "Trying to comprehend it in my head"

Mateo describes much of his classroom engagement as "trying to comprehend it in my head." Rather than demonstrate engagement behaviorally, he chooses to mentally engage in ways that are not readily apparent to an observer. Therefore, while he asserts an ongoing commitment to cognitive engagement, it is quite difficult to ascertain this cognitive effort on a daily basis.

One way that I was able to glimpse Mateo's cognitive engagement was according to his self-professed academic success:

I mean, you know, I have, like, well my report card now is four A's and I might have moved up to a B in one class and this one [honors biology] is a B.

However, while he reported earning very high grades, he simultaneously downplayed his current grade in this honors biology class:

Mateo: I'd say that science is like my worst subject.

Researcher: Really? But you're taking this high level science class...

Mateo: I mean, I don't think of it as high level. Honors to me is not hard compared to some of the AP classes...but this one [honors biology class] is [hard].

Because this class is labeled as honors rather than AP (advanced placement) Mateo seems discontent with the B he is currently earning. His expectations of his abilities in an honors course are not reflected by this grade and are not in line with his personal goals for achievement. This dissatisfaction and resolve to improve are key features of cognitive engagement.

Mateo's cognitive effort might also be discerned according to the work he puts into this Honors Biology class on his own time:

This is the hardest class I've got this year by far...This is the only class where I have to, like, try hard I guess. I think that science in general is not my strongest subject. Like, I do some reading at home from the textbook and I always do the study guides. Usually I do that right at the end when the test is coming up so I can remember it better.

Mateo acknowledges that he must “try hard” and exert the necessary cognitive effort in order to excel. Yet while he sometimes struggles, he is aware of this and is personally accountable for his own level of success during times when he is not at school.

Intangibles

I have described several ways in which Mateo's emotional and cognitive engagement relate to his classroom behaviors. Yet, unlike Owen and Kennedy, Mateo did not readily identify additional influences on his engagement that fell outside of these two categories:

Researcher: So are there other things that make it difficult for you to be engaged in this class?

Mateo: I don't know. I mean, I guess I just don't feel like it sometimes. I don't know really why. But I think that most of the time I am engaged.

While Mateo recognizes that there are times when he does not “feel like” engaging, he was not able (or not willing) to specifically name things which influence this reluctance and/or inability to engage.

The only intangible factor that Mateo specifically pointed to as an impact on his engagement was the flow of classroom instruction back and forth between inquiry and traditional pedagogies. Mateo described that he perceives a mismatch between the inquiry-oriented class activities and the tested materials:

I hate doing like notebook and stuff and reading the book, but it helps you learn the stuff the best. So I would like if she had more activities that had stuff to do with the book instead of some labs that usually don't come up on the test. Because the tests are the ones that I really struggle with.

Mateo's behavioral indifference during laboratory activities may therefore be a product of his inability to see the connections between the activities and the factual material. While he

admits that he enjoys the hands-on activities more than more traditional methods of teaching, he is also skeptical of their importance because they are not as widely assessed on exams.

Summary

In this chapter, I introduced Mateo as a student with a particular way of engaging within Mrs. Jackson's Honors Biology classroom. I classified Mateo as a "silent engager" and I described what this looked like in terms of his classroom behaviors. I then described several facets of his emotional and cognitive engagement that directly influence his willingness to behaviorally engage. Additionally, I identified intangible factors related to classroom pedagogy that he claimed to be barriers to his engagement. In the next chapter, I will synthesize the behaviors of the three focus students and reveal both similarities and differences in behaviors among the three. I will challenge the ways that student behaviors are described and measured in the existing research literature and offer examples from this study that support this challenge. I will highlight the most common influences (emotional, cognitive and intangible) on engagement as revealed by the focus students. Finally, I will describe how the behaviors demonstrated by Owen, Kennedy and Mateo are reproduced across other students in this honors biology class.

CHAPTER EIGHT DISCUSSION

Introduction

In the previous chapters, I described how three focus students, Owen, Kennedy, and Mateo, behaviorally displayed engagement and disengagement in ways very different from one another: vocally, sporadically, and silently. Furthermore, I described the ways behavioral indicators of engagement are tied in some ways to classroom pedagogy. I also identified and described some of the chief factors that each student cited as influences on his/her engagement that were emotionally and cognitively mediated. In this chapter, I will highlight the commonalities and differences among these three focus student experiences. I will also assess the ways in which these three student cases can help to explain what student engagement might look like across other students in this honors biology class. I will discuss some common elements that researchers might pay attention to when broadly seeking to understand student engagement practices. Finally, I will return to the research literature to discuss how my researching findings challenge existing definitions of engagement, measures of engagement, and influences on engagement.

Researcher Voice

I feel it is important to preface my analysis of student engagement with an acknowledgement of the ways this analysis is infused with my own voice and own sense making. As a researcher with a strong personal commitment to student voices, I aimed to truly listen to what students wanted to tell me about their engagement. I wanted to give this

study over to the students in a way that allowed them to tell their stories and share their thoughts with no promise of specific outcomes and no predetermined educational goals. I did not presume that attention to student voices would lead to radical school, curricular or pedagogical reform. My focus was merely upon listening, understanding, and retelling the accounts as honestly and openly as possible. However, I found that this philosophical stance was difficult to follow in practice. While I professed an ideological commitment to student voices, I was not able to fully act on this philosophy as I had wished.

I believe that students are unique beings with unique ways of acting in the world. As such, I believe that each person engages in his/her own way. Yet while each student is an individual, there are certainly patterns of behavior that I recognized among students in this honors biology classroom. Therefore, in order to participate in the larger conversation about student engagement, I felt it necessary to categorize students in particular ways to see whether or not these categories matched with those in existing literature. I also felt it was important to categorize students to see if observed behaviors and reasons for these behaviors would stand up across multiple students. However, I realize that this categorization ultimately portrays students as static figures and labels them in ways that may not always hold true. Furthermore, while these labels may be accurate in this honors biology classroom, I have no reason to either believe or doubt that these labels would hold true in other classroom settings or in non-classroom settings.

Linda Alcoff (1991-1992) asserts that there is a great deal of overlap between speaking *for* others and speaking *about* others. She claims that in speaking *about* someone else, you may in essence be speaking *for* them or in their place. As a researcher, the very language I used to represent a student's situation, goals, and needs was likely infused with

my personal experiences, expectations, and ideals. Therefore, while I greatly valued student voices and strived to keep them at the forefront, I acknowledge that no description of another person can be value-free. Further, in the end, it is my voice that is privileged ultimately in this study, despite all attempts to do otherwise. In the concluding chapter of this dissertation I consider how I and other researchers might do this work differently in the future.

Conflicting Definitions of Student Engagement

The first research question guiding this study asked, “What are the primary indicators of student engagement (verbal and nonverbal) within an inquiry-oriented high school biology classroom?” This question essentially grew out of my own experience as a frustrated high school science teacher struggling to recognize and ultimately increase student engagement. However, at that time, I did not consider that students might have varied and multiple ways of demonstrating engagement. My limited definition of student engagement was tied to student behaviors that suited my own purposes and experiences of school: raising hands, taking notes, answering questions, and physical participation in laboratory activities. Furthermore, I looked at students according to one of two extremes: engaged or disengaged. If a student complied with my vision of engagement, I ultimately categorized him/her as engaged. If a student did not comply with my vision of engagement, I ultimately categorized him/her as disengaged. Yet, students whose behaviors matched with my ideals of engagement didn’t always succeed academically and students whose behaviors I judged to be disengaged oftentimes surprised me with academic success. I now realize that my previous vision of engagement was entirely too narrow.

Existing definitions of student engagement in the research literature are diverse in their scope and focus (Russell et al., 2005; Fredricks et al., 2004; Marks, 2000; Finn, 1989).

This makes student engagement a very complicated phenomenon to study as there is no single way to describe or measure it. The three focus students in this study, likewise, had differing visions of what engagement is and what it looks like. For Owen, student engagement is socially mediated and is reflected according to comfort and confidence interacting with peers. For Kennedy, student engagement is a cognitive process connected to “being interested in what’s going on” and “focusing really hard.” For Mateo, student engagement is a cognitive process that he describes as “if you pay attention and know what’s going on.” Considering the vast majority of research about student engagement that is centered on and measured according to student behaviors (Spanjers et al., 2008; Kumar, 1991; Peterson et al., 1984), it was surprising to me that none of the focus student definitions were closely tied to behaviors. However, even though none of these students conveyed behavioral definitions of student engagement, it does not mean that they were unaware of these behavioral expectations. Owen highlighted several instances where he behaves in ways that are expected of him in order to appear engaged. Kennedy described her perception of herself as a “bad student” as her ADD hinders her from behaving in a “good student” should. Therefore, while students may hold personal convictions of what engagement is, it appears that many still feel pressure to conform to an entrenched and narrow vision of behavioral engagement.

Mrs. Jackson articulated an extensive definition of student engagement that included behavioral and cognitive components. On one hand, Mrs. Jackson describes student engagement as “enthusiasm for what they’re learning” which she assesses according to verbal and nonverbal classroom behaviors. On the other hand, she assesses student engagement cognitively according to whether or not she feels they are involved in the

learning process and whether or not “they appear to be there with me.” Yet, while her definition highlights many different features of engagement, it does not strictly align with any of the focus student definitions. Furthermore, she does not mention any of the emotional components that Owen so vehemently adheres to. If the classroom teacher does not realize that her students ascribe to definitions of engagement that are very different from her own, she is likely unable to effectively meet their instructional needs. Furthermore, if students do not have definitions of engagement that align with the definition held by the classroom teacher they are likely to be mislabeled and misunderstood. Ultimately, Mrs. Jackson may need to expand her definition even more if she hopes to further impact student engagement within her classroom.

Patterns of Focus Student Behaviors

Over my eight weeks of observation I noticed shared behaviors among the three focus students that were both verbal and nonverbal in nature. Each focus student verbally contributed, either regularly or occasionally, in the form of questions and comments. For Owen, these verbal contributions essentially defined him as engager. Owen used his voice spontaneously and forcefully, often without concern for raising his hand or talking over others, as a way to solicit feedback and reactions from Mrs. Jackson and his peers. For Kennedy, verbal contributions served to enhance her own learning as she spoke when she needed and/or wanted to. Furthermore, Kennedy verbally participated when she was recognized by Mrs. Jackson for raising her hand or during moments of classroom silence when she did not have to speak over her peers. For Mateo, verbal contributions were risky and were reserved specifically for situations in which he felt extremely confident that he had the right answer or for situations when he could give his opinion.

In association with verbal contributions, I also observed patterns of silence among the three focus students. Owen, Kennedy and Mateo each exhibited moments in this honors biology classroom where he/she chose not to speak. For Owen, these moments of silence were infrequent and most often demonstrated in small intervals interspersed among a string of verbal comments. Furthermore, moments of silence for Owen commonly manifested themselves as disengagement. For Kennedy and Mateo these periods of silence were the norm as each of them provided limited verbal input. Kennedy's chose to remain silent when she had to compete with her peers to be heard. Mateo chose to remain silent when he was unsure of his content knowledge. However, for both Kennedy and Mateo, silence more often than not represented engagement rather than disengagement.

Furthermore, I observed patterns in nonverbal student behavior which were manifested in student actions and student gestures. Actions that were frequently repeated were in connection to taking notes (present or absent), biting fingernails, fidgeting with pens or other small items, carrying on side conversations with peers (on-task or off-task), drawing, manipulating scientific equipment, using computers, and sleeping. Gestures that were frequently repeated among the focus students were in connection to body posture (upright or slouched), eye contact (following the flow of conversation or not following the flow of conversation), holding the head or face held on one's hands, smiling, and laughing. While I did observe moments when focus students were silent in terms of oral participation within this honors biology classroom, no students were silent in terms of physical participation. In fact, I question whether physical silence is truly possible. While the frequency and subtlety of gestures and actions varied, observation of students always revealed some variability in behaviors.

Making Meaning

In the previous section I highlighted a broad range of verbal and nonverbal behaviors that were repeated among the three focus students. Since behavior is the most common measure of student engagement in the existing literature (Spanjers et al., 2008; Kumar, 1991; Peterson et al., 1984), this is where I also began my research study. I observed students and tentatively interpreted specific behaviors as “engagement” or “disengagement” based on my familiarity with the existing research literature and my personal experiences as a classroom teacher. It soon became apparent why many researchers begin and end with behaviors: it was easy to gain access to student behaviors and it was straightforward to collect behavioral data.

However, once I moved beyond mere observation and instead began to consider student perspectives on their own engagement, these traditional categorizations of behavior soon broke down. I discovered the difficulty of classifying particular behaviors as engaged or disengaged based on mere observation. In fact, my interview data revealed that a behavior that is identified as engagement for one may be perceived as disengagement for another. If I had strictly adhered to behavior counts or strict classification of student behaviors into predetermined categories I would have missed many nuanced actions and interactions that also inform an understanding of student engagement. For example, taking written notes is a widely accepted demonstration of student engagement. I could have chosen to perform behavioral counts and simply judge each incident of note taking as an engaged behavior and each incident of failing to take notes as a disengaged behavior. However, this would have been exceedingly inaccurate. Going beyond the behaviors to also consider the classroom context and student voices gave the action of note taking multiple meanings. Kennedy described that she takes notes when she is interested and engaged while Mateo revealed that

he take notes when he is disengaged as a way to redirect to engagement. Furthermore, I learned that Owen sometimes looks like he is taking notes when he is actually drawing or doodling, sometimes disengaged and other times consciously faking engagement. None of these alternative meanings for taking notes would have been apparent had I simply relied on my initial impressions of this behavior and labeled it as engagement.

I do believe that student behaviors represent an important starting point in understanding their engagement. However, I believe that the existing literature devoted to student engagement is not comprehensive. My research suggests that there are more variables impacting engagement than are possibly contained in a data set limited to outward behaviors. Furthermore, behaviors cannot always be taken at face value. My research suggests a high level of individual variation in regard to how engagement is demonstrated and what influences it. Some student behaviors do match with pre-existing ideals of what engagement looks like while other behaviors do not. The challenge for researchers is to dig deeper into these behaviors to uncover the multiple influences on behavior and the multiple meanings that behaviors may have. I assert that this can only be accomplished by research methodologies that simultaneously attend to the behavioral, emotional and cognitive dimensions of student engagement.

My data also indicates that vocal, outgoing students are often labeled as engaged much more than quieter students. In observing Owen, I was apt to label his behaviors as engaged because they were dynamic and readily apparent. In essence, his behaviors closely resembled the engaged behaviors put forth in existing research literature (Finn, 1989; Tobin & Capie, 1982). Yet, in talking with Owen I found that I frequently mislabeled his behaviors as engagement when he was instead faking engagement. Owen admits that he knows how to

engage in school in ways that *work for* him while also demonstrating engaged behaviors that are *expected of* him. He participates in ways that will solicit responses from his peers and in ways that will appease his teacher. Yet, these behaviors are not necessarily engagement as they are not always in the service of learning. In thinking about Owen as a vocal engager I found that his vocal contributions sometimes meant that he was engaged, sometimes meant that he was faking engagement, and sometimes meant that he was disengaged. In contrast, I found myself struggling to label the behaviors of Kennedy and Mateo because their engagement was much more internalized. Because I could not readily “see” what they were thinking during a class session, I was apt to question my assumptions regarding their engagement. Most often I initially classified their quiet behavior as disengagement, yet came to eventually reclassify some instances of silence as cognitive engagement after carrying on discussions with these students. Again, behaviors were a useful starting point, but my initial impressions of these behaviors did not always hold true upon further analysis of the digital videos and one-on-one interviews.

Influences on Student Engagement

In answer to my second research question which asks, “What do behavioral indicators if engagement mean?”, this study highlights that similarities in behaviors among students may in fact have multiple meanings depending on the emotional and cognitive factors exerting influence on each individual student. In consequence, specific behaviors do not necessarily represent the same things to each person. Essentially, I came to realize that one student’s demonstration of engagement may be, in fact, another student’s demonstration of disengagement. Furthermore, my data leads me to believe that behaviors can be useful indicators of student engagement only if the teacher knows her students as particular types of

engagers. When I first began observing Mateo, I was very confused as to what his quiet subdued behavior meant. Yet, once I began to see patterns in his behaviors and solicited Mateo's perspective on what these behaviors meant, I was able to craft a picture of Mateo as a silent engager. This recognition of Mateo as a particular type of engager was extremely helpful in interpreting his behaviors over time.

While each focus student behaviorally demonstrated engagement differently, there were common influences that each identified as significant to his/her classroom participation. Looking across these three focus student cases, I will reveal common elements that other researchers may consider to when seeking an understanding of student engagement practices. Furthermore, I will compare and contrast the influences revealed in this research study to those espoused in the existing research literature.

Teacher

Existing research suggests that positive student-teacher relationships can increase student engagement across behavioral, emotional and cognitive factors (Dunleavy & Milton, 2008; Yazzie-Mintz, 2007; Skinner and Belmont, 1993; Russell et al., 1992). For Owen and Kennedy, their perceptions of Mrs. Jackson did increase their willingness to behaviorally participate in classroom activities. Owen described how his desire to maintain a positive relationship with Mrs. Jackson influences him to be engaged because it bothers him if his teachers are upset with him. For Kennedy, Mrs. Jackson's tolerance and nonjudgmental nature gives her the confidence to engage as she does not fear how Mrs. Jackson will perceive her. However, Mateo's perception of Mrs. Jackson actually served to limit his behavioral participation. Mateo is concerned with how Mrs. Jackson might view him if he were to provide an incorrect answer to a question. Therefore, instead of taking a chance on

being wrong, he simply chooses not to answer at all. In this way, his relationship with Mrs. Jackson actually causes him some emotional stress and creates a barrier to physical engagement.

Peers

The nature of peer relationships can bring about an array of positive and/or negative classroom outcomes. Within the research literature, positive peer relationships have been tied to behavioral aspects of engagement such as behavior, participation, and academic effort (Berndt & Keefe, 1995; Wentzel, 1994). For Owen, peer relationships greatly impact his behavioral engagement as he ultimately engages in ways to solicit positive peer responses and feedback. At times, these peer relationships serve to increase his engagement. At other times his desire to interact and talk about topics unrelated to the instruction lead to disengagement. For Mateo, his newly formed relationships with peers at a new school have been cultivated to a point where he feels that he knows everyone in the classroom and feels comfortable with them. Yet, this comfort and familiarity does not translate into increased classroom participation. Furthermore, Mateo asserts that relationships with his peers do not have any impact, either positively or negatively, on his academic effort.

There is also evidence that cognitive engagement is enhanced when students and their peers work in collaborative groups to carry out discussions and debate ideas (Guthrie & Wigfield, 2000; Newmann, 1992). However, this did not hold true within this research study. Collective group work actually served to decrease cognitive engagement for Owen as peer interactions were a distraction rather than an enhancement. Similarly, Kennedy deems group activities frustrating. While she enjoys the activities themselves, she is often annoyed when her peers are unwilling to engage and exert effort equal to her own. Therefore, while

group activities often enhance her behavioral engagement, this doesn't necessarily equate to cognitive investment or increased learning.

Physical Needs

Kennedy and Owen both described how their willingness and ability to engage in classroom activities is impacted by immediate physical needs. For Kennedy, engagement is impacted daily by Attention Deficit Disorder (ADD). At other times, her engagement is impacted by more transient physical ailments such as sickness. Kennedy described her struggle to engage in Mrs. Jackson's description of a lab activity because "she [Mrs. Jackson] was just sort of talking and I wasn't feeling well so I was just like, uggggg, I'll just read the instructions later." While laboratory activities often provide an avenue for Kennedy to be behaviorally and cognitively engaged, her physical needs can serve as a barrier to this engagement.

Students also pointed to fatigue and hunger as influences on their engagement. Owen described how hunger affects his engagement when "you haven't eaten lunch, your full, so like there's different [reasons] there's lots." Likewise, Kennedy described how staying up late to do homework the night before caused her to be too tired to want to engage in honors biology the next day. Owen and Kennedy both recognize instances when they are disengaged and often actively try to redirect themselves back to engagement. However, these physical factors, singularly and in combination, ultimately exert an overwhelming influence over his/her ability to do so.

Content

It has been suggested that the key to student engagement lies more with pedagogical strategies than the content itself (Tytler, et al., 2008). Drawing from my classroom

observation and analysis of digital videos, I did not observe altered patterns of focus student behaviors across scientific topics. For example, Owen's vocal engagement held consistent across the scientific topics of DNA, meiosis, and genetics. However, my interview data revealed that it is not necessarily the subject matter, but rather the difficulty of the subject matter that may impact student engagement. Owen and Kennedy both described how their willingness to engage was impacted by the difficulty of the content that was presented. Kennedy described how "sometimes when we have a Powerpoint and I'm like 'I already know this', so I'm just going to draw". Similarly, Owen asserted that biology comes quite easily to him. When he is presented with material that is easy or has already been presented to him in the past, he struggles to stay engaged. Mateo also described an incident when he disengaged from a classroom video because he had already seen it and was confident in the content it addressed. Therefore, my data suggests that engagement is perhaps impacted by the rigor of the content rather than the subject matter itself.

Pedagogy

There is evidence to suggest that learning is enhanced when teachers use pedagogies that are active, varied, experiential, challenging, and tied to real-world issues (Russell et al., 2005; Driscoll, 2000). Each of the three focus students in this study self-reported either an A or B for a grade in this course, which suggests that they were, in fact, learning. Furthermore, the focus students enthusiastically voiced their support for pedagogies where they were allowed to be active participants. Owen declared that the classroom activities are "fun" and asserted "that's how biology should be." Mateo expressed that he enjoys "the labs that are more hands on, like we're doing something." However, their classroom engagement behaviors did not necessarily reflect this learning and stated interest. I observed Owen

display extremely disengaged behaviors during inquiry-oriented activities that were most often reflected in off-topic conversations with peers. Mateo's classroom physical and verbal behaviors in inquiry-oriented pedagogies were largely identical to his behaviors during traditional pedagogies. Kennedy was the only focus student whose engagement was positively impacted by inquiry-oriented pedagogies as they increased her physical participation and led longer periods of sustained engagement.

If inquiry pedagogies do in fact represent best practice, why did the focus students' behaviors not positively reflect that? One possible reason is that students struggled with their perceived mismatch between inquiry pedagogies and the material they were responsible for on standardized assessments. Kennedy confessed that she has "trouble sort of like doing the labs and connecting that to the book information that we need for the test." Mateo also described his difficulties connecting the activities to the assessment expectations and asserted that he would "like if she [Mrs. Jackson] had more activities that had stuff to do with the book instead of some labs that usually don't come up on the test." While students embrace activities which are tied to real world issues and involve physical participation, they ultimately still worry about getting good grades. Therefore, they may not engage in inquiry-oriented pedagogies if they do not believe they are important enough.

A second possible reason why the students' behavioral engagement was not positively impacted by inquiry pedagogies may be due to extreme emotional impact of peers and/or the classroom teacher. Both Mateo and Owen described how their behaviors were generally influenced by a fear of "being wrong" or "saying something that makes me look stupid". In Owen's case, behavioral engagement is influenced by a desire to fit in and interact with his friends. In Mateo's case, behavioral engagement is influenced by a desire

not to draw too much attention to himself unless he is sure his statements and actions are correct. These very powerful social pressures may, in the end, serve as more powerful forces on behaviors than the choice of pedagogy.

A third possible reason why the students' behavioral engagement was not positively impacted by inquiry pedagogies may be that existing research is simply insufficient. It is possible that inquiry-oriented pedagogies do not always increase student engagement in ways that are anticipated. Given the individual variability in student engagement that was revealed in this study, it is important to revisit the notion that different students learn in different ways. While inquiry pedagogies may increase engagement for some students it may simultaneously decrease engagement for others. No single pedagogy is ideal in all situations.

A fourth possible reason why the students' behavioral engagement was not positively impacted by inquiry pedagogies may be due to the specific types of inquiry activities that Mrs. Jackson utilized. Inquiry is diverse in its scope and exists along a continuum of activities that are more structured to activities that are very open-ended (National Research Council, 2002; Colburn, 2000). During my eight weeks of observation, Mrs. Jackson implemented classroom activities that afforded varying degrees of student self-direction. Yet, the majority of the instruction would ultimately be classified as either guided inquiry or partial inquiry as they did not cover all of the essential elements of inquiry⁶ as set forth in the National Science Education Standards (National Research Council, 2002). While her instruction was consistently student centered, few activities could be classified as open

⁶ The *National Science Education Standards* identify five essential elements of inquiry teaching and learning:

- (1) Learners are engaged by scientifically oriented questions.
- (2) Learners give priority to evidence, which allows them to develop and evaluate explanations that address scientifically oriented questions.
- (3) Learners formulate explanations from evidence to address scientifically oriented questions.
- (4) Learners evaluate their explanations in light of alternative explanations, particularly those reflecting scientific understanding.
- (5) Learners communicate and justify their proposed explanations.

inquiry. This suggests the possibility that open inquiry may provide opportunities for students to be engaged in ways that guided or partial inquiry do not.

How Are Focus Students Experiences of Engagement Replicated by Others?

Although I was interested in the experiences of each student in this particular honors biology classroom, I felt it necessary to identify three focus students whose behaviors I closely monitored and analyzed. In this way, I was able to gain a deeper understanding of three individual experiences rather than a surface understanding of all students. However, in my limited observations of and interviews with other students in this honors biology classroom, I found behavioral demonstrations of engagement that were similar to my focus students. In traditional pedagogical settings many students verbally contributed, either regularly or occasionally, in the form of questions:

Michael: Do you have to reproduce with someone else with that same thing to pass it on?

Mrs. Jackson: Yes, to get the minus/minus but to get the plus/minus you could mate with just anyone.

Michael: So typically don't people know about this disease?

Mrs. Jackson: So can they do something?

Michael: And years and years and years from now, couldn't they be eradicated?

or in the form of comments:

Andy: Well this is sort of off topic.

Mrs. Jackson: Uh-oh. (smiles)

Andy: Well it has something to do with this subject.

Mrs. Jackson: I'm listening.

Andy: You know I just learned that the average male ejaculation contains enough sperm to impregnate every woman in the United States twice.

Mrs. Jackson: This is true. So women beware. (class laughter) Those are the kind of details that make this educational to know! (laughs)

Student questions and comments were also inserted during inquiry-oriented group projects and laboratory activities. These were especially recognizable during one class session where students worked in groups to create dances that represented the various stages of meiosis:

Michael: Curt, what is the next thing that we need to represent?

Curt: You line up on the middle so the middle of the cell would be like right there.

Ashton: You take a step up and you all take a step back and we're there. (giving directions)

Curt: The middle of the cell would be like that and that (gestures with his arms)

Michael: Right, that's the equatorial plate.

Curt : Then you cross over.

Jenna: How do we do that? Like this? (crosses her leg over her partner's leg)

Michael: Yeah, that's a great idea! Just, Boom! And cross over the legs and that's our crossing over. We need to cross over (points to his partner) but we don't need to cross over (points to another pair of students)?

Curt: Yeah, because crossing over with the identical doesn't make any sense.

In contrast to verbal participation, students in this honors biology classroom replicated the periods of silence that were demonstrated by the focus students. The nature and frequency of this silence varied in that some students more closely resembled Owen, the vocal engager, and others more closely resembled Mateo, the silent engager. Some students were rarely silent and other students were often silent. For some students, silence represented engagement while for other students silence represented disengagement. Furthermore, all of the gestures and actions that were demonstrated by the focus students were likewise displayed by other students in this honors biology classroom.

Making More Meaning

While other students in this honors biology class displayed behaviors that were similar to the behaviors of the three focus students, the reasons for these behaviors varied greatly from person to person. There were multiple occasions during the course of

conducting this research where I classified a particular student as engaged or disengaged based upon behavior only to question my initial assumptions during an interview with that student. For example, I asked David about his behavioral engagement as captured in a video segment:

Researcher: So if I were to come and watch class some day and I were to look at you, how would I be able to tell that you are engaged?

David: If I'm not distracted by Avish you mean? (laughs) Usually I'll have at least one arm up on my face or chin kind of looking that way (demonstrates by looking to his left) so I can block out Avish and what's going on over there.

David's description of how his body posture demonstrated engagement was in sharp contrast to my perceptions of this body posture. I had classified this posture as disengaged as he seemed bored or sleepy by resting his head on his chin. In reality, he told me that he was engaging as he attempted to block out classroom distractions. I would never have known this and would have classified this behavior inaccurately had I not talked with David. This difficulty inferring engagement based solely on behavior can also be demonstrated by my observations of Sarah. Sarah regularly follows the flow of classroom conversation with her eyes and her body posture suggests engagement as she is erect and forward in her seat. Yet, I wondered at her ability to sustain engagement for such long periods of time:

Researcher: You're a hard person for me to read! (Sarah laughs) When I observe you, I feel like you're always looking at Mrs. Jackson for the most part but I'm not sure that you're engaged. I'm not sure if you're really taking it all in or if you're just like, 'Ok, I'm looking at her but I am not thinking about what she's saying'. So help me. (both laugh)

Sarah: Most of the time I think I am engaged...But I guess that sometimes, like, I'll be thinking about something else but still looking at her. Which is kind of hard for you because you're not going to be able to judge that. (laughs)

Sarah acknowledges that her behaviors suggest engagement at times when she is not engaged. She also acknowledges that there is no way for an observer to realistically judge what these behaviors mean. Again, without talking to Sarah I would have likely misclassified her behaviors as I did not understand what they meant. In another example, Jonathan surprised

me with his declaration of engagement wherein his slouched body posture and lack of verbal participation had convinced me otherwise:

A lot of people would say [engagement is] I guess raising your hand and asking questions but I find that's unnecessary a lot of the times. I don't know. I just like sitting there quietly and coming up with my own conclusions...I don't think it's not necessary. It's a necessary part. It's just not my role.

While I initially read Jonathan's lack of verbal and physical participation as disengagement, he interpreted how much of the time his engagement is internalized and cognitive in nature.

These three examples only scratch the surface concerning my misreading of student behaviors and serve to further question the findings of behaviorally dominant research that does not embrace the multidimensional nature of student engagement.

Faking It

The importance of allowing students to explain their behaviors became even more fundamental as an intriguing notion of faking it arose within this research study. For Owen, faking it was tied to his desire to maintain a positive relationship with Mrs. Jackson. For Kennedy, faking it was to keep out of trouble as she reported that "a lot of teachers will call you out if they think you're not engaged and I don't really want to be called out." Yet the focus students were not alone in their experiences of faking it. I conducted interviews with three focus students and seven additional students in this honors biology classroom. Out of the 10 students with whom I conducted interviews, eight admitted to either occasionally or regularly faking engagement.

As an example of faking engagement I observed one particular class session where Mrs. Jackson was presenting a Powerpoint lecture from the back of the classroom. Eu-meh was seated two rows in front of Mrs. Jackson, slouched down in her seat and discretely sending text messages on her phone. In fact, the behavior was so discrete that it was difficult for me to detect it. In going back to my digital video recording I found that Eu-meh was

texting for several minutes before I picked up on it. Furthermore, I was only able to detect this behavior due to my position in the front corner of the classroom. In contrast, Mrs. Jackson was positioned behind Jessica there was no way for her to observe this behavior from her vantage point. However, as Mrs. Jackson suddenly started walking to the front of the room, Eu-meh's behavior changed strikingly. She tucked the phone quickly in her pocket, slid upright in her chair and began to nod as Mrs. Jackson talked. Eu-meh's behavioral transformation was sudden and dramatic. I showed Eu-meh a video segment of this event and asked her to offer some insight:

Eu-meh: Well, I look over the slides and stuff at home. I look at it before she presents so I kind of get it already. And, well, I can multitask. Like, I can listen and do other things and I really will remember it.

Researcher: Ok, so why did you change what you were doing when she [Mrs. Jackson] came closer? When you became aware of where she was?

Eu-meh: Oh (laughs) because you're not supposed to text in class!

Researcher: So did you want her to think you were paying attention more than you were or you just didn't want her to know you were texting?

Eu-meh: (laughs) I mean, kind of both.

Eu-meh changed her behavior to not only hide her disengagement as she texted on her phone, but she also changed her behavior to suggest to Mrs. Jackson that she was indeed engaged more than she actually was. Eu-meh's incident of faking engagement is not unique. This notion of faking it also arose in a discussion with John:

Researcher: Are there ever times when you are pretending to be engaged but you're not really engaged?

John: Oh yeah. All the time!

Researcher: So why would you pretend to be engaged as opposed to just not doing it? Why pretend?

John: So I don't get into trouble...I don't want to be called out.

John described that he regularly fakes engagement as a way to stay out of trouble. He doesn't want the negative attention that comes with being "called out" so he instead pretends to be engaged as a way of hiding disengagement.

Connections between Faking It and Pedagogy

Each of the eight students who cited incidents of faking engagement connected these to traditional pedagogies involving lecture and large group instruction. The students explained how pretending to write notes or inserting appropriately placed nods and affirmative responses served to mimic authentic engagement. Yet, none of the students that I interviewed correlated faking it with inquiry-oriented pedagogies. This is not to say that disengagement was absent during inquiry-oriented pedagogies. While I did observe students to be off task during group projects and hands-on activities, there was very little evidence to suggest that students purposefully faked engagement at those times. Off-task behaviors and off-task conversations did arise during these inquiry activities, but as an observer these moments of disengagement were readily recognizable. Furthermore, my observations and categorizations of student behavior during inquiry activities closely aligned with students' own explanations of these actions. When students appeared engaged they were, in fact, engaged. When students appeared disengaged they were, in fact, disengaged.

Learning to Fake It

While the reasons *why* students fake engagement are compelling, larger questions might be how students *learn* to fake engagement in the first place and why they think they *need* to fake it. As students are subjected to traditional pedagogies in which they are regarded as producers rather than consumers, traditional power hierarchies also come into play (Freire, 2004; Moll, Amanti, Neff, & Gonzalez, 1992). Teacher centered pedagogies

put the teacher in an obvious position of authority (Freire, 2004; Schultz, 2003).

Furthermore, students are not only put into a position of inferiority due to their status as students but also due to their age. I would argue that this positioning is unique to schools in that students perceive one existing level of power differential; school adults and school students. School adults are in charge while school students must submit. Adults make rules while students must follow them. There are few or no opportunities to break out of this power differential and, unlike workplaces, no aspirations of moving up within this hierarchy. Therefore, one might suppose that if students can't disrupt this hierarchy they instead learn to adapt and adjust to these power inequalities. Within the classroom, this translates into behaviors that mimic the behaviors that are expected of them. Rather than putting physical and mental effort towards authentic engagement, students instead put the effort toward pretending to be engaged. Students know what engagement is supposed to look like, so they demonstrate these behaviors when they are not willing or able to authentically engage.

Summary

In this chapter, I revealed the distinct definitions of student engagement held by Owen, Kennedy and Mateo. I compared and contrasted these student conceptions of engagement to Mrs. Jackson's definition as well as the definitions in the existing research literature. I argued that these widely varying definitions must be reconciled in order to better understand and positively impact student engagement. I also described the verbal and nonverbal behaviors that were shared among the three focus students. I problematized the deliberation of behaviors as the sole measure of engagement. Furthermore, I stressed the necessity of talking with students in order to reveal meanings behind and influences on observable behaviors. In this chapter, I also described the most common influences on

engagement as revealed by the three focus students. I discussed how these influences both agreed and conflicted with ideas espoused in the existing literature. Finally, I explored the notion of “faking it”. I described how this phenomenon is linked to traditional and inquiry-oriented pedagogies. I addressed the reasons that students fake engagement, how they learn to fake engagement, and why they feel the need to fake engagement. In the next chapter, I will introduce some implications that this research study has for classroom research, science teacher education, and classroom teachers. I will discuss some limitations of this research, provide recommendations for further research, and reflect on how this study has impacted my personal understanding of student engagement.

CHAPTER NINE IMPLICATIONS

Introduction

This research adds to the existing body of literature that seeks to describe and understand student engagement. The chosen methodology, theoretically influenced by student voices and feminist epistemology, answers the call for research that unites the behavioral, emotional, and cognitive factors of engagement within a single study (Fredricks et al., 2004; Guthrie & Wigfield, 2000). Deliberate selection of a teacher participant who regularly utilizes contemporary, inquiry-oriented pedagogies also provides insight into the ways in which these pedagogies can affect student engagement. Furthermore, the commitment to student voices reveals the necessity of talking with students about their engagement in order to make accurate judgments of their behaviors. The insights gained from this study have further implications for classroom research, science teacher education, and classroom teachers.

Implications for Classroom Research

This study highlighted the need for including student voices in any discussion of student engagement. While many verbal and nonverbal behavioral patterns were repeated among students, the reasons for these behaviors and the influences on them were very different from one student to another. I found that observation was important for identifying student behaviors, but interviews with students were crucial for understanding these behaviors. Based on my findings, I frankly question the reliability of any study of student

engagement that relies exclusively on observations of student behaviors and/or teacher perception of student behavior.

This research study was unique as it was deliberately situated in a classroom with a teacher who not only asserted a philosophical commitment to inquiry-oriented pedagogies but also demonstrated this commitment in her daily instructional choices. Previous studies of student engagement have either been carried out in traditional, teacher centered classrooms or have been carried out with little to no discussion or consideration of classroom pedagogy. I believe that deliberately positioning this research study within an inquiry-oriented classroom allowed me to observe a wide array of student behaviors and experiences that would not have been otherwise observable. Furthermore, because Mrs. Jackson adheres to a philosophy of “balance” in her pedagogical choices, I was able to compare and contrast student behaviors in traditional and inquiry-oriented settings.

Implications for Science Teacher Education

Contemporary science education reform advocates pedagogies that are hands-on and student centered as a means to engage students and create long-term connections to STEM (NRC, 1996; NSTA, 1994; AAAS, 1990). Concurrently, the students in this research study overwhelmingly voiced their preference for a hands-on, active approach to learning over a more passive approach. Yet, while students felt that they best learned with inquiry pedagogies, this does not mean that inquiry pedagogies were able to provide constant incentive to be engaged. An important finding of this study is that the willingness to be engaged and the ability to be engaged are two very different things for students. Students come into schools with a wide array of emotional and cognitive influences that change from day to day or even from minute to minute. Furthermore, intangibles such as hunger, sleep,

and sickness greatly come to bear on student engagement. Therefore, just because inquiry pedagogies do not consistently bring about sustained engagement for each student, it does not mean that they should be discarded as ineffective or that they do not represent best practice.

While teacher educators prepare novice teachers to utilize inquiry-oriented pedagogies, they also need to prepare them for the realities of classroom life. Novice teachers need to understand that even “best practices” do not always yield desired results. As Mrs. Jackson’s demonstrates, pedagogical balance is worth consideration. Some students seek out traditional teaching methods and thrive under these conditions. Therefore, while inquiry pedagogies have been linked to increased student engagement (Baldwin, 2004; ESRC, 2004) they do not magically work for all students in all situations. Furthermore, it is all too often assumed that if a student is engaged the teacher is responsible, but if a student is not engaged it is the fault of that student (Zyngier, 2008). This way of thinking objectifies students as products to be behaviorally manipulated and controlled by teachers via methodologies and approaches. Instead, I would assert that we need to move toward a mindset where *fault* of disengagement lies neither with the teacher nor the student. In fact, fault may have no place at all in the discussion of engagement. The reality is that the life of a high school student is ever-changing and entirely unpredictable. Students try to engage and sometimes fail. Other times they don’t even try to engage because of life circumstances. Taking a cue from Mrs. Jackson, teacher educators need to prepare novice teachers to embrace students where they are and “hold them in the light” in times when engagement flourishes and in times when it does not.

This research also suggests that it is perhaps time for teacher educators to stop preparing teachers to engage students in particular ways. Owen, Kennedy and Mateo all

reported they were receiving a grade of either an A or B in this honors biology class. Yet, each of them demonstrated unique approaches to engagement that essentially worked for them. Owen is a verbal engager who sustains engagement for long periods of time. Kennedy is a sporadic engager who jumps between periods of engagement and disengagement in rapid succession. Mateo is a silent engager who internally makes meaning of the content on his own. Owen's behaviors most closely match with the narrow range of engaged behaviors espoused in the existing research literature (Spanjers et al., 2008; Kumar, 1991). Kennedy and Mateo exhibit behaviors that deviate from these views of engagement and additionally display many of the disengaged behaviors identified in the research literature. Yet, all three of these students experience academic success. This suggests that the existing vision of an engaged student is entirely too narrow. Instead, a range of student engagement types are certainly possible, each of which may ultimately lead to the same endpoint of successful learning.

Implications for Classroom Teachers

This study highlights that it is important for teachers to make an ongoing effort to know and strengthen relationships with their students. Mrs. Jackson serves as an exemplar of the positive effect that a caring, personable, vulnerable teacher can have on student engagement. Mrs. Jackson knows students as learners and as people. She understands their personalities and their backgrounds. Yet, I would assert that this notion of knowing students could extend to a discussion of knowing students as particular types of engagers. This research fills an existing gap in the research literature as I have classified individual students as particular types of engagers based upon patterns of classroom behaviors and the reasons revealed for these behaviors. Each of my three focus students was selected based upon these

differing behaviors, yet these behaviors were representative of the broad spectrum of student behaviors demonstrated in this honors biology classroom. It is possible that multiple students may be categorized as either vocal engagers, sporadic engagers, or silent engagers. It is also possible that close observation and interviews may lead to the creation of many additional categories of engagers. Ultimately, if classroom teachers want to increase student engagement, they need to begin to know students as particular types of engagers, not simply as engaged or disengaged.

Limitations

There are several limitations to this study. First, this research was limited by time. While I spent eight weeks observing and interviewing students, I felt that each day revealed new and interesting instances of student engagement. A longer observational period would have likely revealed additional student behaviors and influences on these behaviors. Student engagement is a broad, complex concept. While I believe that my study provided a starting point for researching and thinking about student engagement in new ways, much additional research time is warranted.

Second, the data was limited by students' willingness to use their voices and share their experiences within this honors biology classroom. I was only given access to the limited portion of their voices that they felt comfortable sharing. For some students this was substantially more than for other students. Furthermore, given the constraints of the students' busy schedules, it was quite difficult to find times when they were available for interviews. While I would have liked to have conducted additional interviews with the focus students to gain deeper and broader views of their voices, this was difficult to facilitate.

A third limitation is the small sample size. This research study represents a case study of one honors biology classroom. With only 26 student participants it was difficult to reveal the full array of both diversity and commonalities among student experiences of engagement. A larger sample size would likely provide more variability and lead to unique findings that may not arise in with this particular group of students. Furthermore, while three focus students were chosen for their unique demonstrations of engagement, these three categorizations are undoubtedly not inclusive. A larger number of focus students would likely reveal further engagement types and highlight distinct patterns of behavior that were not revealed in this small sample.

A fourth limitation to this study was my inability to conduct a formal post-study interview with Mrs. Jackson. Due to concerns raised by the University of North Carolina at Chapel Hill Internal Review Board, I was unable to reveal specific research findings to Mrs. Jackson until the honors biology course had ended. Therefore, while I was able to conduct an informal member check at the end of the study, I was not able to gain her perspective regarding my interpretations of engagement for specific students or specific circumstances. This additional layer of insight and analysis would have greatly strengthened by research findings.

Finally, this research study is limited by my inability to genuinely privilege student voices. While I strove to listen to what students wanted to tell me about their engagement, it was my own voice that was ultimately dominant. I still do believe that consideration of student voices is crucial to understanding student engagement. However, I acknowledge that my research methodology needs to be reconsidered and reconceptualized in order to attain this goal. For instance, it may have been beneficial to start with student interviews rather

than classroom observation. This would have provided a lens in which student assertions of their behaviors propelled my observations rather than the assertions of behaviors in the existing literature.

Recommendations for Further Research

Although I named the engagement types of three focus students within this research study, it is reasonable to expect that other engagement types also exist. Further research is necessary to connect observable verbal and nonverbal behaviors with the students' own explanations for these behaviors. Such research may reveal students who fit into the categories I have named and/or may reveal distinct categories in addition to the ones I have proposed.

As student engagement types are further described and classified, research may be warranted that correlates engagement types with academic performance. An understanding of how student engagement types translate into academic performance could have profound implications for classroom teachers who make daily instructional decisions. Each of the three focus students in this research study self-reported a course grade of either an A or a B. Yet, it was beyond the scope of this study to thoroughly correlate student engagement types with academic achievement. I believe this to be an important next step. If it can be shown more substantially that multiple engagement types are positively correlated with academic success, this has important implications for classroom teachers as they broaden their personal visions of what engagement looks like. Likewise, if particular engagement types are not shown to correlate with academic success, this also has important implications for teachers seeking to increase student engagement within their classrooms.

The interesting notion of faking engagement that arose in this study is another area where additional research may be concentrated. It is notable that student descriptions of faking engagement were exclusively tied to traditional pedagogies. I would hypothesize that students are able to fake engagement due to the historically predictable and scripted nature of traditional classroom instruction. I would also suppose that the varied nature of inquiry pedagogies diminish the ability and desire for students to fake engagement. However, these are merely my unsupported opinions regarding this phenomenon. Future research is needed to uncover the specific features of traditional pedagogies and inquiry-oriented pedagogies that promote and/or inhibit “faking it.”

This research study simultaneously concentrated on student behavior, emotion and cognition in an effort to better understand student engagement. However, while I specifically looked for ways in which these factors were interrelated and interdependent, it was necessary at times to separate them and speak about them solitarily. Therefore, future research may move towards methodologies that more closely unite these three factors into a single unit. In particular, the process of cogenerative dialogue may provide teachers, students and researchers the opportunity to work together to create knowledge and construct understandings about student engagement (Eldin & Levin, 1991; Roth, Tobin & Zimmermann, 2002). This process may serve to blur the lines between the behavioral, emotional and cognitive factors of student engagement while simultaneously highlighting, valuing, and emphasizing student voices.

Finally, research may be warranted that expands upon the context of engagement from a classroom focus to a school-wide focus or even a daily life focus. For instance, it may be extremely interesting to follow one particular student throughout his/her day in order to

see how engagement varies according to various in school and out of school settings.

Identification of influences on engagement outside of a science classroom may offer new possibilities for thinking about and encouraging student engagement within that classroom.

Furthermore, such studies would highlight the dynamic, multidimensional nature of student engagement that may not be revealed within the context of a secondary science classroom.

Final Reflections

As I observed and talked with students, I became acutely aware of my limited vision of what student engagement was and what it looked like. I was surprised to find how often I misread the behaviors of students and how my biased notion of engagement contributed to these misjudgments. As I inaccurately read student behaviors as a researcher, I am sure I also misread student behaviors as a classroom teacher. Sadly, I am convinced that I am not alone; this misreading is entirely too frequent. Thus, this research study strengthened by already solid resolve to talk *with* students about their engagement rather than simply talking *about* them.

This study was a second chance for me to revisit my own frustrations concerning student engagement. As a researcher, I was now in a fortunate position to sit down one-on-one with students and carry out conversations regarding observed classroom behaviors and reasons for classroom behaviors. Unfortunately, most classroom teachers do not have the time to do this. Teachers are limited to brief periods of time before and after school or between classes where they can interact with students on a personal level. Furthermore, the demands on this already limited time are significant. My wish is for this study to incite additional research that directly helps classroom teachers to understand and increase student engagement in their classrooms, just as I wished someone had helped me.

APPENDIX A

STUDENT INTERVIEW PROMPTS

- (1) How do you define student engagement?
- (2) What kinds of things do you do when you are engaged in an activity/lesson? What do you do when you are not engaged?
- (3) Do you ever act like you are working or paying attention when you really aren't? Why or why not? Examples?
- (4) What percentage of the time would you estimate that you are engaged in science class? Why?
- (5) Why did you say this particular statement/ask this particular question in class? (identify from video clip)
- (6) What influences whether or not you speak in class? Who do you most often speak to? Who do you not speak to?
- (7) What influences the types of statements you make or questions you ask in class?
- (8) Are you ever uncomfortable or embarrassed speaking or participating in class? Why or why not?
- (9) How does your teacher usually respond when you speak in class? How would you like her to respond?
- (10) How does your teacher usually respond if you don't speak in class? How would you like her to respond?
- (11) How do your peers usually respond when you speak in class? How would you like them to respond?
- (12) How do your peers usually respond when you don't speak in class? How would you like them to respond?
- (13) Do you ever feel that you talk too much in class? Do you ever feel that you talk too little in class? Why or why not?
- (14) What were you thinking about during this particular activity? (show video clip)
- (15) Why did you make this particular gesture in class? (show video clip)

- (16) What were you thinking about when the teacher was talking about this specific content? (show video clip)
- (17) When you are engaged in a class/activity how does that affect your understanding of the content?
- (18) What are the most important science concepts/facts that you learned from this specific class period?
- (19) Do you ever watch television shows, read books, or find information online about things you learn in biology class? Why or why not?
- (20) Do you ever talk to people outside this class (friends or family) about what you are learning in Biology II? Why or why not?
- (21) During class, do you ever think about ways the content relates to your personal experiences (things you have done or seen)? Examples?

APPENDIX B
TEACHER PRE-STUDY INTERVIEW PROMPTS

- (1) What is your philosophy of inquiry teaching?
- (2) How do you incorporate inquiry into your own teaching?
- (3) How would you describe your relationship with your students? Why?
- (4) How do you think inquiry pedagogies impact the way you interact with your students?
- (5) How would you define student engagement?
- (6) How do you think inquiry pedagogies impact student engagement?
- (7) How was this specific course designed? What were your major instructional considerations?
- (8) What will be the topics of instruction over the next eight weeks?
- (9) Summarize the pedagogical strategies that will be incorporated over the next eight weeks.
- (10) Is the content and pedagogy over the next eight weeks reflective of your usual practice throughout the semester? Why or why not?

APPENDIX C
MAJOR VERBAL CODES AND SUBCODES

CODE	SUBCODE	EXAMPLE
VERBAL: Student Question	Information Seeking	“So what can you do to make the mucus more fluid?”
	Clarification	“Did you say that introns or exons code for proteins?”
	Procedural	“So if we do the competition, do we have to do the 5 page paper separately?”
	Comment Phrased as Question	“So, we put it in the flame after we dip it, right?”
	Tangential/Self-Initiated Question	“What about something like skin cancer? Is that harder to detect or easier [than breast cancer]?”
	Single Word Question	“Why?”
	Off-Task Question	“Mrs. Jones, are you going to the basketball game tonight?”
VERBAL: Student Comment	Answers Teacher Question (Directed to Teacher)	“It’s accepted into the bacteria easier.”
	Answers Teacher Question (Directed to Peers)	“We have 57 base pairs of a couple thousand and there were other founder mutations somewhere on the gene so we can’t tell.”
	Answers Peer Question (Directed to Teacher)	“I know someone with CF [cystic fibrosis].”
	Answers Peer Question (Directed to Peers)	“We have to find the restriction site first and then match the pairs.”
	Comment Prompted by Teacher Talk	“They replicate.”
	Comment Prompted by Peer Talk	“But the company shouldn’t have to find the money for that.”
	Tangential/Self-Initiated Comment	“I had a dream last night that a snake from one of these tanks bit me!”

	Single Word Comment	“Yeah.”
	Off-task Comment	“Mrs. Jones, how do I get the data from the day I was gone?”

APPENDIX D
MAJOR NONVERBAL CODES AND SUBCODES

CODE	SUBCODE
NONVERBAL: Student Actions & Gestures	Drawing
	Eye contact
	Eyes wandering
	Eyes averted
	Fidgeting with body
	Fidgeting with object
	Writing
	Sleeping
	Yawning
	Smiling
	Laughing
	Raising Hand
	Slouched Body Posture
	Erect Body Posture
	Head in Hands
	Manipulation of Laboratory Materials
	Drawing

APPENDIX E
INTERPRETATIONS AND REINTERPRETATIONS OF CODES

	Code(s)	Observed Behavior	Researcher Initial Interpretation	Student Interpretation	Researcher Revised Interpretation
Owen	<p>Comment Prompted by Peer Talk</p> <p>Erect Body Posture</p> <p>Eye Contact</p>	<p>During a class debate regarding the ethics of medical research and the dissemination of test results, Owen spontaneously stands up out of his chair and delivers a speech in response to peer comments which assert his viewpoint on the topic of discussion:</p> <p>“Although we are not obligated, we have moral responsibility. Let’s say we don’t give her the answer. She can go get tested somewhere else but it’s going to cost her a lot of money...This is stepping in and helping someone else and giving them all the options.”</p>	<p>Owen’s verbal and nonverbal behaviors both suggest engagement. Owen regularly contributes vocally and this incident matches that pattern. Owen’s comments are clearly delivered and suggest thoughtfulness. He is making eye contact with several peers. He is standing (without being asked to do so) rather than sitting in his chair.</p>	<p>Owen confirmed that he felt that he was engaged in the class debate. He enjoyed the activity because it was something out of the ordinary and very flexible. He also “liked the back and forth banter” among students.</p>	<p>My initial impressions of student engagement were confirmed by the student himself. Vocal engagement was evident and clearly matched with non-verbal actions.</p>

	Code(s)	Observed Behavior	Researcher Initial Interpretation	Student Interpretation	Researcher Revised Interpretation
Owen	Writing	Owen is doing a significant amount of writing in his notebook as Mrs. Jackson presents a Powerpoint presentation on DNA translation.	Writing/taking notes is not a typical behavior for Owen. Instead, he usually shifts eye contact between Mrs. Jackson and the projector screen. I wonder what is different about today? Taking notes is typically interpreted as engaged behavior, but I wonder if this is true for Owen since it is an atypical behavior for him? Also, Owen is very quiet today (3 brief verbal contributions over 20 minutes), which suggests disengagement to me.	I showed Owen a video segment from this class period which depicted him with his head down for long stretches of time writing. Owen revealed that he was not writing notes, but rather drawing pictures in his notebook. He mentioned that he was tired because he was “up until 11 last night doing homework.”	Owen’s behavior originally made me think he was taking notes, which I tentatively labeled as engaged behavior. However, Owen revealed that he was actually drawing pictures and was disengaged from the activity. This makes more sense in connection with his lack of vocal contributions and lack of eye contact that are usual patterns for him. This might be labeled as disengagement but was also a possible example of faking engagement.
Kennedy	Eyes Wandering Yawning Head in Hands	Kennedy is staring out the door as Mrs. Jackson presents a Powerpoint lecture. Her eyes are fixed and her body is slouched down in her seat. She glances up at the screen but then yawns, puts her head on her folded arms and stares back out into the hallway.	This period of sustained behavior (5+ minutes) is atypical for Kennedy. She is usually much more irregular in her behaviors. Her body language and lack of eye contact suggest disengagement. It seems very unlikely that she is listening or internalizing much of the information that is being presented.	Kennedy affirmed that she was having a difficult time engaging. “She [Mrs. Jackson] was doing most of the talking and I just didn’t feel like writing that day. I figured I could go back and read her slides later.”	Kennedy affirmed my initial impression of her disengagement. Her sustained nonverbal behaviors were in stark contrast to her normal pattern of erratic, quickly changing behaviors. I did not observe any deliberate attempts to fake engagement. She was simply disengaged.

	Code(s)	Observed Behavior	Researcher Initial Interpretation	Student Interpretation	Researcher Revised Interpretation
Kennedy	Eyes Wandering Eye Contact Yawning Tangential/ Self-Initiated Question	Kennedy's nonverbal behaviors are constantly changing. She looks out into the hallway. She looks back at the screen. She looks at Mrs. Jackson. She rubs her eyes and yawns. Then she surprisingly asks a question and follows up with a statement: "Is there a way for like them to test for that?" "Because I remember a while ago there was some celebrity, I don't know if this was it, but somehow she got tested for the probability of having like breast cancer..."	I am having a very difficult time interpreting Kennedy's behaviors today. Her gestures by and large suggest disengagement but she then inserts a very thoughtful question and statement that is related to the content being presented. I wasn't even sure she was listening to what was being said, let alone internalizing and synthesizing it in order to make this insightful connection.	Kennedy asserted that she has trouble looking at Powerpoint slides with lots of text due to her ADD. When learning becomes difficult for her, she waits until there is a time where she can get back into what is going on. She also stated that she brings up things in class when it is interesting to her or would be good to know but might not necessarily be brought up by the teacher.	Kennedy's description of her nonverbal behaviors as on again, off again matches directly with my observations. However, these rapid shifts in engagement make it difficult for me to ascertain how much of the content she is retaining in the moment. This is why her vocal contribution took me by surprise. There was a definite mismatch between verbal and nonverbal behaviors in this instance. However, Kennedy's ever-changing nonverbal participation matched with the pattern I have come to notice for her.

	Code(s)	Observed Behavior	Researcher Initial Interpretation	Student Interpretation	Researcher Revised Interpretation
Mateo	Writing	Mateo is writing lots of notes today while Mrs. Jackson discusses the symptoms and genetic causes of various diseases.	Mateo is not verbally participating in this discussion which is what I expected to observe based on past patterns. I have noticed that he takes notes on occasion but not regularly. I am curious why he is writing today but did not write yesterday when the pedagogy was much the same. Is it the content? I assume he is more engaged today for some reason than he was yesterday. This nonverbal behavior is striking since he is regularly very silent and very still. Very few observable behaviors to suggest anything in terms of engagement or disengagement.	Mateo described that he takes notes when he is bored and struggling to pay attention. Conversely, he described that he does not take notes if it's more of an exciting class because he can remember it without the need to write things down.	My interpretation of this behavior was entirely backward from Mateo's explanation of it. He does not take notes on a regular basis, so I assumed this behavior represented moments when he was in fact engaged. However, I've come to understand that these are instead moments when he is trying to redirect from disengagement to engagement. Interesting that this suggests that Mateo is engaged much more of the time than I initially gave him credit for. If these infrequent moments represent disengagement then, conversely, engagement would be more of the norm for him. This is a very difficult behavior to assess at face value.

	Code(s)	Observed Behavior	Researcher Initial Interpretation	Student Interpretation	Researcher Revised Interpretation
Mateo	Eye Contact	Mateo is working with a group during a paper plasmids laboratory activity. He does not participate on the ongoing banter with his group members, either on-task or off-task. He does not physically participate in the activity by cutting strands, helping to arrange them on the lab table or taping at various intervals. He merely observes.	As usual, Mateo does not verbally participate. Furthermore, he does not physically participate. However, this is difficult to read because his behaviors don't reflect engagement, per se, but they also don't demonstrate disengagement. He is not off-task and seems to be watching and trying to understand. I do not know if he is engaged or not.	Mateo stated that he enjoyed the activity and felt like he was engaged. I pointed out that I wasn't able to observe him verbally or physically participate and he said it was because "other people were already doing it so I just let them do it."	As is usually the case I am still struggling to identify Mateo as engaged or disengaged. He asserts that he was engaged but his behaviors are so nuanced that it is hard to find any observational evidence to support this. In this case, I must take him at his word. The only observational support for this is that he was not demonstrating classic disengaged behaviors so could conceivably be engaged as he states.

REFERENCES

- Alcoff, Linda. (Winter 1991-1992). The problem of speaking for others. *Cultural Critique*, 20, 5-32.
- Altheide, D., & Johnson, J. (1994). Criteria for assessing interpretive validity in qualitative research. In N. Denzin and Y. Lincoln (Eds.), *Handbook of Qualitative Research* (pp. 485-499). Thousand Oaks, CA: Sage.
- American Association for the Advancement of Science. (1990). *Science for all Americans*. New York: Oxford University Press.
- American Chemical Society Statement on Education Policy. (2007). Retrieved January 15, 2009, from American Chemical Society Website:
http://portal.acs.org/portal/fileFetch/C/WPCP_011527/pdf/WPCP_011527.pdf
- Anderson, E. (2009). Feminist Epistemology and Philosophy of Science. Retrieved August 3, 2009, from Stanford Encyclopedia of Philosophy Website:
<http://plato.stanford.edu/entries/feminism-epistemology/>
- Anyon, J. (1980). Social class and the hidden curriculum of work. *Journal of Education*, 162(1), 67-92.
- Apple, M., & Beane, J. (1999). *Democratic schools: Lessons from the chalk face*. Buckingham: Open University Press.
- Appleton, J., Christenson, S., & Furlong, M. (2008). Student engagement with school: Critical conceptual and methodological issues of the construct. *Psychology in the Schools*, 45(5), 369-386.
- Appleton, J., Christenson, S., Kim, D., & Reschly, A. (2006). Measuring cognitive and psychological engagement: Validation of the Student Engagement Instrument. *Journal of School Psychology*, 44, 427-445.
- Baldi, S., Jin, Y., Skemer, M., Green, P., Herget, P., & Xie, H. (2007). *Highlights from PISA 2006: Performance of U.S. 15-Year-Old Students in Science and Mathematics Literacy in an International Context*. Retrieved October 31, 2008, from National Center for Educational Statistics Web site: <http://nces.ed.gov/pubs2008/2008016.pdf>
- Baldwin, S. (2004). Students and teacher as co-researchers: Developing multicultural awareness in a high school class. In E. T. Stringer (Ed.), *Action Research in Education*, (pp. 203-208). Upper Saddle River: Pearson Education Inc.

- Bangert-Downs, R. & Pyke, C. (2002). Teacher ratings of student engagement with educational software: An exploratory study. *Educational Technology Research and Development*, 50(2), 23-38.
- Barton, S. (1997). *Linguistics: An Introduction to Linguistics*. Retrieved April 1, 2009 from Web site: <http://www.geocities.com/CollegePark/3920/index.html#mail>
- Basu, S.J. (2008). How students design and enact physics lessons: Five immigrant caribbean youth and the cultivation of student voice. *Journal of Research in Science Teaching*, 5, 881-899.
- Berndt, T. J., & Keefe, K. (1995). Friends' influence on adolescents' adjustment to school. *Child Development*, 66, 1312-1329.
- Bernstein, B. (1990). The structuring of pedagogic discourse. *Vol. IV: Class, codes and control*. Routledge: London.
- Bethel-Fox, C. & O'Connor, F. (2000). *The Primary and Secondary School Classroom Climate Questionnaires: Psychometric Properties, Links to Teacher Behaviours & Student Outcomes, and Potential Applications*. Retrieved December 10, 2008, from Transforming Learning Web site: http://www.transforminglearning.co.uk/documents/NDA_Climate_Design.doc
- Caraway, K., Tucker, C., Reinke, W., & Hall, C. (2003). Self-efficacy, goal orientation, and fear of failure as predictors of school engagement in high school students. *Psychology in the Schools*, 40(4), 417-427.
- Carlsen, W. (1991). Questioning in classrooms: A sociolinguistic perspective. *Review of Educational Research*, 61, 157-178.
- Cazden, C. (1988). *Classroom discourse: The language of teaching and learning*. Portsmouth, NH: Heinemann Educational Books, Inc.
- Chambers, D.W. (1983). Stereotypic images of scientists: The draw-a-scientist-test. *Science Education*, 67, 255-265.
- Chin, C. & Osborne, J. (2008). Students' questions: a potential resource for teaching and learning science. *Studies in Science Education*, 44(1), 1-39.
- Christenson, S.L. (2002). *Families, educators, and the family-school partnership: Issues or opportunities for promoting children's learning competence?* Paper prepared for the 2002 invitational conference: *The Future of School Psychology*. Indianapolis, IN.
- Christenson, S. L., & Anderson, A. R. (2002). Commentary: The centrality of the learning context for students' academic enabler skills. *School Psychology Review*, 31, 378-393.

- Christenson, S. L., & Thurlow, M. L. (2004). School dropouts: Prevention considerations, interventions, and challenges. *Current Directions in Psychological Science*, 13, 36-39.
- Clegg, Ambrose, A. (1987). Why Questions?, In Willen, William W. (Ed.), *Questions, Questioning Techniques, and Effective Teaching* (pp. 11-21). Washington, DC: National Education Association.
- Coffey, A. & Atknison, P. (1996). *Making Sense of Qualitative Data*. Thousand Oaks, CA: Sage.
- Colburn, A. (2000). An Inquiry Primer. *Science Scope*, March, 42-44.
- Connell, J. P., Spencer, M. B., & Aber, J. L. (1994). Educational risk and resilience in African-American youth: Context, self, action, and outcomes in school. *Child Development*, 65, 493-506.
- Cook-Sather, A. (2002). Authorizing students' perspectives: Toward trust, dialogue, and change in education. *Educational Researcher*, 31(4), 3-14.
- Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches*. Thousand Oaks, CA: Sage
- Dillon, J.T. (1988). The remedial status of student questioning. *Journal of Curriculum Studies*, 20(3), 197-210.
- Driscoll, M.P. (2000). *Psychology of learning for instruction* (2nd ed.). Boston, MA: Allyn & Bacon.
- Dunleavy, J & Milton, P. (2008). Student engagement for effective teaching and deep learning. *Education Canada*, 48(5), 4-8.
- Duran, J. (1991). *Toward a feminist epistemology*. Savage, MD: Rowman & Littlefield Publishers, Inc.
- Eldon, M. & Levin, M. (1991). Co-generative learning: Bringing participation into action research. In W. F. Whyte (Ed.). *Participatory action research* (pp. 51-84). Newbury Park, CA: Sage.
- Ellsworth, Elizabeth. (1989). Why doesn't this feel empowering? Working through the repressive mythis of critical pedagogy. *Harvard Educational Review*, 59(3), 297-324.
- Erickson, F. (2006). Definition and analysis of data from videotape: Some research procedures and their rationales. In J. Green, G. Camilli, & P. Elmore (Eds.). *Handbook of Complementary Methods in Educational Research* (pp. 177-191). Mahwah, NJ: Lawrence Erlbaum Associates.

- Erogan, I. & Campbell, T. (2008) Teacher questioning and interaction patterns in classrooms facilitated with differing levels of constructivist teaching practices. *International Journal of Science Education*, 30(14), 1891-1914.
- ESRC. (2004). *Consulting Pupils About Teaching And Learning: An ESRC Network Project*. Retrieved January 2, 2010 from the Consulting Pupils About Teaching and Learning website: <http://consultingpupils.co.uk>.
- Estrem, Heidi. (1997). Both Ursula and Ariel: Searching for a feminist/expressivist theory of voice. *WILLA*, VI, 13-17.
- Fielding, M. (2001). Students as radical agents of change. *Journal of educational change*, 2,(2) 123-41.
- Fielding, M. (2004). 'New Wave' student voice and the renewal of civic society. *London Review of Education*, 2(3), 197-217.
- Finn, J. D. (1989). Withdrawing from school. *Review of Educational Research*, 59, 117-142.
- Finn, J. D. (1993). *School engagement and students at risk*. Washington, DC: National Center for Education Statistics.
- Finn, J. D., & Rock, D. A. (1997). Academic success among students at risk for school failure. *Journal of Applied Psychology*, 82, 221-234.
- Fletcher, A. (2009). *Frameworks for Meaningful Student Involvement: What Makes Student Involvement Meaningful?* Retrieved January 5, 2010 from SoundOut Web site: <http://www.soundout.org/frameworks.html>
- Florio-Ruane, S. (1987). Sociolinguistics for Educational Researchers. *American Educational Research Journal*, 24(2), 185-197.
- Fraser, B.J. (1994). Research on classroom and school climate. In Gabel, D. (Ed.), *Handbook of Research on Science Teaching and Learning* (pp. 493-541). New York: Macmillan.
- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, 74, 59-109.
- Fullarton, S. (2002). *Student engagement with school: Individual and school-level influences* (No. 27, Longitudinal Surveys of Australian Youth Research Report). Camberwell, Victoria: Australian Council for Educational Research.

- Gamorman, A., & Nystrand, M. (1992). Taking students seriously. In Newman, F. (Ed.), *Student Engagement and Achievement in American Secondary Schools* (pp. 40-61), New York, NY: Teachers College Press.
- Gee, J.P. (2005). *An introduction to discourse analysis*. New York, NY: Routledge.
- Glesne, C. (1999). *Becoming qualitative researchers* (2nd ed.). NY: Longman.
- Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The Qualitative Report*, 8(4), 597-607.
- Grasser, A. & Person, N. (1994). Question asking during tutoring. *American Educational Research Journal*, 31(1), 104-137.
- Green, J., Camilli, G., & Elmore, P. (2006). *Handbook of complementary methods in education research*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Greenwood, C. R., Horton, B. T., & Utley, C. A. (2002). Academic engagement: Current perspectives on research and practices. *School Psychology Review*, 31(3), 328 – 349.
- Guthrie, J. T., & Wigfield, A. (2000). Engagement and motivation in reading. In M. Kamil, R. Barr, P. Mosenthal & D. Pearson (Eds.), *Handbook of reading research III* (pp.403-425), New York: Longman.
- Hofstein, A., Navon, O., Kipnis, M., & Mamlock-Naaman, R. (2005) Developing students' ability to ask more and better questions resulting from inquiry-type chemistry laboratories. *Journal of Research in Science Teaching*, 42(7), 791-806.
- Hofstein, A., Shor, R., & Kipnis, N. (2004). Providing high school students with opportunities to develop learning skills in an inquiry-type laboratory. *International Journal of Science Education*, 26(1), 47-62.
- Jenkins, E.W. (2006). The student voice and school science education. *Studies in Science Education*, 42, 49-88.
- Jimerson, S. R., Campos, E., & Greif, J. L. (2003). Toward an understanding of definitions and measures of school engagement and related terms. *California School Psychologist*, 8, 7-27.
- Kadlac, A., Friedman, W., & Ott, A. (2007). *Important, But Not For Me: Kansas and Missouri Students and Parents Talk About Math, Science and Technology Education*. Retrieved December 2, 2008, from Public Agenda Web site: http://www.publicagenda.org/files/pdf/important_but_not_for_me.pdf
- Klem, A. M., & Connell, J. P. (2004). Relationships matter: Linking teacher support to student engagement and achievement. *Journal of School Health*, 74(7), 262– 273.

- Kumar, D.D. (1991). A meta-analysis of the relationship between science instruction and student engagement. *Educational Review*, 43(1), 49-61.
- Lensmire, T. (1998). Rewriting student voice. *Journal of Curriculum Studies*, 30, 261–291.
- Levin, T., & Long, R. (1981). *Effective instruction*. Washington, DC: Association for Supervision and Curriculum Development.
- Marks, H. M. (2000). Student engagement in instructional activity: Patterns in the elementary, middle, and high school years. *American Educational Research Journal*, 37, 153–184.
- Mason, C.L., Kahle, J.B. and Gardner, A.L. (1991). Draw a scientist test: Future implications. *School Science and Mathematics*, 91, 193-198.
- McFadden, M., & Munns, G. (2002). Student engagement and the social relations of pedagogy. *British Journal of Sociology of Education*, 23(3), 357-366.
- McGarity, J., & Butts, D. (1984). The relationship among teacher classroom management behavior, student engagement, and student achievement of middle and high school science students of varying aptitude. *Journal of Research in Science Teaching*, 21(1), 55-61.
- Merriam, Sharan B. (2009). *Qualitative research: A guide to design and implementation*. San Francisco: Jossey-Bass.
- Midgley, C., Feldlaufer, H., & Eccles, J. S. (1989). Student teacher relations and attitudes toward mathematics before and after the transition to junior high school. *Child Development*, 60, 981-992.
- Miller, R. B., Greene, B. A., Montalvo, G. P., Ravindran, B., & Nichols, J. D. (1996). Engagement in academic work: The role of learning goals, future consequences, pleasing others, and perceived ability. *Contemporary Educational Psychology*, 21, 388– 422.
- Mirta, D.L. (2004) The significance of students: Can increasing ‘student voice’ in schools lead to gains in youth development? *Teachers College Record*, 106(4) 651-88.
- Moll, L.C., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory into Practice*, XXXI, 132–141.

- Murphy, S. (2001). No-one has ever grown taller as a result of being measured revisited: More educational measurement lessons for Canadians. In J. P. Portelli, & R. P. Solomon (Eds.), *The erosion of democracy in education* (pp. 145-167), Calgary: Detselsig.
- National Research Council. (1996). *National Science Education Standards*. Washington, DC: National Academy Press.
- National Research Council. (2002). *Inquiry and the National Science Education Standards: A Guide for Teaching and Learning*. Washington, D.C.: National Academy Press.
- National Research Council and the Institute of Medicine. (2004). *Engaging schools: Fostering high school students' motivation to learn*. Washington, DC: The National Academies Press.
- National Science Foundation, Division of Science Resources Statistics. (2008). *Science and Engineering Degrees: 1966–2006. Detailed statistical tables NSF 08-321*. Retrieved December 3, 2008, from National Science Foundation Web site: <http://www.nsf.gov/statistics/nsf08321/>
- National Science Board. (2007). *National Action Plan for Addressing the Critical Needs of the U.S. Science, Technology, Engineering, and Mathematics System*. Retrieved December 3, 2008, from National Science Foundation Web site: http://www.nsf.gov/nsb/documents/2007/stem_action.pdf
- National Science Teachers Association. (1994). *Scope, sequence, and coordination project: The content core*. Washington, DC: NSTA Press.
- Newmann, Fred. (1992). *Student engagement and achievement in American secondary schools*. New York, NY: Teachers College Press.
- Newmann, F., Wehlage, G. G., & Lamborn, S. D. (1992). The significance and sources of student engagement. In F. Newmann (Ed.), *Student engagement and achievement in American secondary schools* (pp. 11-39). New York: Teachers College Press.
- Orlikowski, W. J., & Baroudi, J. J. (1991). Studying information technology in organizations: Research approaches and assumptions. *Information Systems Research*, 2(1), 1-28.
- Ortner, M. (1992). Interrupting the calls for student voice in “liberatory” education: A feminist postructuralist perspective, in C. Luke & J. Gore (Eds.), *Feminisms and Critical Pedagogy* (pp. 74-89). New York: Routledge.
- Parker, J. G., & Asher, S. R. (1987). Peer relations and later personal adjustment: Are low-accepted children at risk? *Psychological Bulletin*, 102, 357-389.

- Patton, M. Q. (2002). *Qualitative evaluation and research methods* (3rd ed.). Thousand Oaks, CA: Sage Publications, Inc.
- Pearson, J. & West, R. (1991). An initial investigation of the effects of gender on student questions in the classroom: Developing a descriptive base. *Communication Education*, 40, 22-32
- Peterson, P., Swing, S., Stark, K., & Waas, G. (1984). Students' cognitions and time on task during mathematics instruction. *American Educational Research Journal*, 21, 487-515.
- Pierce, K.M. (2005). Posing, pretending, waiting for the bell: Life in high school classrooms. *The High School Journal*, December 2005/January 2006, 1-15.
- Polman, J.L. & Pea, R.D. (2001). Transformative communication as a cultural tool for guiding inquiry science. *Science Education*, 85, 223-38.
- Reda, M. (2009). *Between speaking and silence*. New York: State University of New York Press, Albany.
- Reschly, A. & Christenson, S. L. (2006). Research leading to a predictive model of dropout and completion among students with mild disabilities and the role of student engagement. *Remedial and Special Education*, 27, 276-292.
- Reynolds, A. (1992). What is competent beginning teaching? A review of the literature. *Review of Educational Research*, 62(1), 1-35.
- Roadrangka, V. & Yeany, R. (1985). A study of the relationship among type and quality of implementation of science teaching strategy, student formal reasoning ability, and student engagement. *Journal of Research in Science Teaching*, 22(8), 743-760.
- Rogers, A. (2005). *Student Voice: Bridges to Learning*. Retrieved January 6, 2010 from University of Washington School of Education Website: <http://depts.washington.edu/k12admin/l4l/capstone/rogers.html>
- Roth, W-M., Tobin, K., & Zimmermann, A. (2002). Coteaching/cogenerative dialoguing: learning environments research as classroom praxis. *Learning Environments Research*, 5, 1-28.
- Rumberger, R. & Thomas, S. (2000). The distribution of dropout and turnover rates among urban and suburban high schools. *Sociology of Education*, 73(1), 39-67.

- Russell, V. J., Ainley, M., & Frydenberg, E. (2005). *Student Motivation and Engagement*. Retrieved October 28, 2008 from Schooling Issues Digest Web site: http://www.dest.gov.au/sectors/school_education/publications_resources/schooling_issues_digest/schooling_issues_digest_motivation_engagement.htm
- Rutherford, F.J., & Ahlgren, A. (1990). *Project 2061: Science for all Americans*. New York: Oxford University Press.
- Schultz, K. (2003). *Listening: A framework for teaching across differences*. New York: Teachers College, Columbia University.
- Sefa Dei, G. (2003). Schooling and the dilemma of youth disengagement. *McGill Journal of Education*, 38(2), 241-256.
- Shapiro, E. S. (2004). *Academic skills problems: Direct assessment and intervention* (3rd ed.). New York: Guilford.
- Shernoff, D. & Schmidt, J. (2008). Further evidence of an engagement - achievement paradox among u.s. high school students. *Journal of Youth and Adolescence*, 37, 564-580.
- Sinclair, M. F., Christenson, S. L., Lehr, C. A., & Anderson, A. R. (2003). Lessons learned: Implications for student engagement intervention based on years of check & connect implementation studies. *The California School Psychologist*, 8(1), 29-42.
- Skinner, E.A., Wellborn, J., & Connell, J.P. (1990). What it takes to do well in school and whether I've got it: The role of perceived control in children's engagement and school achievement. *Journal of Educational Psychology*, 82, 22-32.
- Skinner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effect of teacher behavior and student engagement across the school year. *Journal of Educational Psychology*, 85, 571-581.
- Spanjers, D., Burns, M., & Wagner, A. (2008) Systematic direct observation of time on task as a measure of student engagement. *Assessment for Effective Intervention*, 33(2), 120-126.
- Spellings, M. (2006). *U.S. Must Act to Keep Pace with the World in Math and Science*. Retrieved October 31, 2008 from U.S. Department of Education Web site: <http://www.ed.gov/news/opeds/edit/2006/02112006.html>
- Teese, R. V., & Polesel, J. (2003). *Undemocratic schooling: Equity and quality in mass secondary education in Australia*. Carlton, Vic.: Melbourne University Publishing.

- Teitelbaum, M. (2006). *A New Science Degree to Meet Industry Standards*. Retrieved October 31, 2008 from Issues in Science and Technology Web site: http://www.issues.org/23.1/p_teitelbaum.html#
- The Chronicle of Higher Education News Blog. (2008). *Drive For More Science Graduates Falls Behind Its Goals*. Retrieved January 12, 2008 from The Chronicle of Higher Education Web site: <http://chronicle.com/news/article/4837/drive-for-more-science-graduates-falls-behind-its-goals>
- Thomas, E. (2007). Student engagement and learning in a community-based arts classroom. *Teachers College Record*, 109(3), 770-796.
- Tobin, K.G. & Capie, W. (1982). Relationships between classroom process variables and middle school science achievement. *Journal of Educational Psychology*, 74(3), 441-454.
- Tytler, R., Osborne, J., Williams, G., Tytler, K., & Cripps Clark, J. (2008). *Opening Up Pathways: Engagement in STEM Across the Primary-Secondary School Transition*. Canberra: Australian Department of Education, Employment and Workplace Relations. Retrieved October 25, 2009 from: http://www.dest.gov.au/sectors/career_development/publications_resources/profiles/Opening_Up_Pathways.htm#authors
- Wentzel, K. R. (1991). Social competence at school: Relations between social responsibility and academic achievement. *Review of Educational Research*, 61, 1-24.
- Wentzel, K. R. (1994). Relation of social goal pursuit to social acceptance, classroom behavior, and perceived social support. *Journal of Educational Psychology*, 86, 173-182.
- Willis, J.W., Jost, M. & Nilakanta, R. (2007). *Foundations of qualitative research: Interpretive and critical approaches*. Sage Publications: Thousand Oaks, CA.
- Willms, J. (2003). *Student engagement at school: A sense of belonging and participation*. Results from PISA 2000. Paris: Organisation for Economic Co-operation and Development.
- Yazzie-Mintz, E. (2007). *Voices of Students on Engagement: A Report on the 2006 High School Survey of Student Engagement*. Bloomington: Center for Evaluation & Education Policy, Indiana University. Retrieved October 2, 2008, from Center for Evaluation & Education Policy Web site: <http://ceep.indiana.edu/hssse/pdf/HSSSE2006Report.pdf>

- Zeichner, K. & Schulte, A. (2001). What we know and don't know from peer-reviewed research about alternative teacher certification programs. *Journal of Teacher Education*, 54(4), 266-282.
- Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist*, 21, 3-17.
- Zyngier, D. (2007). Listening to teachers-listening to students: Substantive conversations about resistance, empowerment and engagement. *Teachers and Teaching Theory and Practice*, 13(4), 327-347.