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Finding Change Agents: A Qualitative Case Study on Perceptions of Education Leaders During the Implementation of the Next Generation Science Standards

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FINDING CHANGE AGENTS: A QUALITATIVE CASE STUDY ON PERCEPTIONS OF EDUCATION LEADERS DURING THE IMPLEMENTATION OF THE NEXT GENERATION SCIENCE STANDARDS

by

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ABSTRACT

This study is a qualitative case study of middle schools located in a rural public school district in a southern state in the United States that has implemented the Next Generation Science Standards (NGSS) which explored the roles of education leaders in the implementation of NGSS. Participants included teachers, instructional coaches, and district administrators. The findings of the study include how a lack of training for NGSS impacted the effectiveness of education leaders, district leadership focused on curriculum instead of the standards, the response to teacher frustrations led to an adversarial relationship with the district, and education leaders exist in many contexts within the district. Education leaders can benefit from the findings of the presented study by understanding the challenges faced by this district and how education leaders within the district responded to those challenges.

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DEDICATION

To Jeane, my mother, who hung the moon.

And Tosha, my wife, who made a good life great.

And finally to my children, Sawyer and Caroline, who frequently and effectively distracted me from working on my dissertation.

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God gave the rose its grace of glow,

And the lark its radiant glee;

But, better than all, I know, I know

God gave you to me.

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Alex, I did not forget about you. I just wanted to make you sweat it out and wonder if I would mention you. Older brothers are the worst, aren’t we?

CHAPTER 1

INTRODUCTION

Implementation of standards is a vital skill for education leaders, especially as the standards become more complex like those provided in the Next Generation Science Standards (NGSS). NGSS is a national science standardization for K-12 education that ties together three learning dimensions, Disciplinary Core Ideas, Science and Engineering Practices, and Cross-Cutting Concepts, for every standard to help students build a more cohesive understanding of science and create student-scientists that are more able to address the emerging needs of society. The majority of school districts previously used quantitatively and qualitatively different standards, and the level of complexity of NGSS is significantly higher (NGSS, 2013).

Education leaders also must know how to connect NGSS with an understanding of what standards are and how they are useful (Glatthorn et al., 2019; Stiles et al., 2017). Additionally, education leaders should be using standards to help drive school goals that help align classrooms with the vision of their school districts (DeMink-Carthew et al., 2017; Glatthorn et al., 2019). In an attempt to develop a richer understanding of these connections, the research explores NGSS implementation in a public school district in

the rural South and perceptions of what roles education leaders have played in the implementation of NGSS.

Statement of the Problem

The United States has arrived at a critical moment for science education where a lack of emphasis on science education content has come into direct conflict with an increase in the societal need for a deeper understanding of science. Science education has been declining in large part due to well-meaning but misguided national programs, specifically, No Child Left Behind (NCLB) and Race to the Top (RTTT), which pushed elementary school teachers to focus the majority of their attention on math and reading (NGSS, 2013). The result of removing the focus from science education is that national scores never outperformed student test scores obtained before the implementation of NCLB (Strauss, 2015). While there are instances after the implementation of RTTT where some regions saw improvements in science scores, those scores rarely outperformed pre-NCLB scores (NGSS, 2013). NGSS are fundamentally different from all previous national education standards for science and require a much more rigorous understanding of how the standards connect to learning.

At the same time that the federal government was, likely unintentionally, deemphasizing science education, the need by society for a deeper understanding of science became even more pronounced. This societal need is developing on multiple fronts with political and individual ramifications. While the gap between cybersecurity professionals and unfilled jobs continues to grow, the United States faces an unprecedented number of cyberattacks (Rogers & Spring, 2020). A reduction in scientific knowledge has led to political ramifications as citizens try to distinguish between actual

scientific facts and the ever-increasing tide of false information available on the Internet (Scheufele & Krause, 2019). Society suffers as a result of poor science education, which contributes non-scientific theories such as false beliefs that vaccines cause autism (Offit et al., 2014), that the Earth is flat (Wolchover, 2017), or that social distancing and facemasks do not help reduce the spread of a virus (Wall et al., 2021).

Improving science education by creating a more rigorous set of national standards was the goal of the developers of the NGSS (NGSS, 2013). A connection exists between the level of engagement of school leaders and the implementation of the NGSSin K-12 public education. The current study examines those connections in a public school district in the rural South. Additionally, the current study seeks to provide a richer context for the methods used by education leaders to implement NGSS.

Theoretical Framework

Distributed Leadership Theory examines the interactions between school leaders, their followers, and the different aspects of their specific situations. Distributed Leadership Theory acts as an alternative to a single-leader theory, rejecting the need for a single person to act as the all-knowing authority and moving toward leadership styles that encourage multiple leaders to supervise smaller pieces of the entire system (Spillane, 2006).

Spillane emphasizes that Distributed Leadership Theory focuses on having the practice of leading as the primary goal, that it stems from the interactions between all stakeholders, and that the situation plays a significant role in the relationship with leadership practice. Spillane points to other leadership theories that fail because they are centered around the individual’s skills and are not concerned with the connections

between administrators, teachers, and students. Distributed Leadership Theory focuses on the system and its functions holistically instead of focusing on the principal as a Superman figure (Spillane, 2006).

Examining education leaders through the lens of Distributed Leadership Theory is vital in helping to establish which of these leaders is most likely to lead the change required in the implementation of NGSS. It is necessary to examine as many levels of education leadership as possible because it is likely that the most effective educational leaders will not be administrators but rather leaders closer to the classroom.

Statement of Purpose

The purpose of the study is to generate thick descriptions that will lead to a richer perspective of the roles that education leaders play in implementing NGSS. These education leaders do not have to be administrators, though many will be district- and school-level administrators. Other education leaders studied include teacher leaders, department chairs, and team leaders. Understanding how education leaders provided assistance and clarification for the implementation of NGSS helped establish a connection between the actions these leaders believe they took during implementation and the actual actions taken as the district implemented NGSS.

Research Questions

RQ1: *What roles have education leaders played in middle schools implementing NGSS?*

RQ2: *What are the teacher perceptions of the role of education leaders in NGSS?*

Researcher Positionality

Qualitative researchers enter into a study with preconceived notions about their likely findings, and those notions can shape how they interpret their findings, making it essential that researchers are honest about their biases and how those could affect their findings (Yin, 2018). The researcher's current professional position is as a math and science teacher in a public education classroom. Additionally, the researcher serves as an education leader, which provides him with experience connecting school leaders and curriculum implementation. The researcher also serves on a state-level public school committee that connects standards to state testing.

The following expectations are assumptions about what the research will reveal, but the research could prove these to be incorrect. The researcher believes that school leaders who are more involved in the implementation of NGSS will result in teachers who are more confident in their skills regarding teaching according to the methods suggested by NGSS. Additionally, the researcher believes teachers with more positive views of the implementation of NGSS will partner with stronger education leaders at the team and departmental levels. The researcher also believes that teachers reporting success with implementation but receiving little or no leadership support will have less effective implementation of NGSS. Finally, the researcher believes that most education leaders above the departmental level will report almost identical implementation involvement and that their roles will have a lower level of importance to the success of NGSS implementation.

Limitations

Limitations of the current study exist outside of the researcher's control but may affect the study's findings. The current study has the same limitation that most educational research has in that it is not an actual experiment. The nature of a case study also creates some limitations regarding external validity. In addition, no intervention or experimentation was used, so no claim can be made for cause and effect. Most of the research was not directly observable since the events happened in the past, so the dependence of the recollection of participants created another limitation. Finally, some documentation will not be directly accessible to future researchers because of student confidentiality.

Delimitations

Delimitations of the current study included things that the researcher excluded from the research intentionally that could affect the findings but fell outside the conditions set for the case study. Upper-level district leaders such as the superintendent and assistant superintendents did not participate in the case study. These leaders played pivotal roles in providing support for the implementation of NGSS, but their roles tended to be indirect. Another district leadership classification excluded from the current study was those responsible for deciding the curriculum of multiple schools, such as the K-2 supervisor. While these leaders played more direct roles in implementing NGSS, these roles still tended to be more holistic and rarely provided direct intervention into a specific classroom. These district leaders provided financing and professional development, but professional development usually fell to curriculum coordinators.

Another group not included in the current study was schools within the district that had not implemented NGSS because of either indifference to district mandates or because of exemption from implementation. The only school that qualified for the exemption in this district was the alternative school that used an online curriculum for instruction that did not require creating lesson plans. Any data collected from this school would have provided little insight toward answering the research questions centered around implementing a standards-based classroom. Additionally, the students in the alternative school had spent time at their home schools and time in the alternative environment, so it would have been difficult to differentiate between instructional outcomes that resulted from one campus or the other.

Significance of the Study

In an attempt to clarify the roles that education leaders played during the implementation of NGSS, the current study provided a richer perspective of the methods the leaders used to assist teachers with implementation. A researcher hoping to understand what methods might be effective during the implementation of NGSS or other standards-based curricula could use the findings to help guide further research questions. District leadership could also understand these leaders' roles during implementation to help shape their responses to new curricula as they evolve.

These roles must become clarified to help education leaders close the gap between the reality of science education provided by public education in the United States and the needs of society to have a firmer grasp of science. NCLB and RTTT both resulted in a degradation of science education while the need for society to understand science increased dramatically (NGSS, 2013). NGSS are significantly different from any

previous national science standards for public education, which requires education leaders to have a deeper understanding of the standards and how those standards exist in practice. Understanding the standards is vital for meeting society's needs, which requires citizens to have a deeper understanding of science to help not only with individual understanding but to help understand the real-world ramifications of political decision-making.

Definition of Terms

The following definitions will assist the reader in understanding the context of terms as applied to the research.

Curriculum: Specific learning objectives and the activities suggested for each standard (Glatthorn et al., 2019).

Curriculum Leader: For the current study, a curriculum leader is any member of the public education system that works with multiple people to ensure that the standards alignment are horizontal and vertical to any curriculum used on a school campus (Glatthorn et al., 2019).

Education Leader: For the current study, an education leader is any member of the public education system that directly assists teachers with implementing NGSS.

Next Generation Science Standards: National science standards, which are purposefully rich in content and practice, are arranged across multiple disciplines and grade levels to provide all students a benchmarked science education (NGSS, 2013).

Professional Development: Providing teachers with training for pedagogical practices or subject matter updates (Glatthorn et al., 2019).

Recommended Curriculum: A curriculum recommended by scholars, associations, and reform commissions,also including requirements set forth by federal and state governments (Glatthorn et al., 2019)

Standards: Academic expectations for students that feature an alignment of the critical elements of the educational system to promote attainment of these expectations (Hamilton et al., 2008). Hamilton et al. define them as what a student should know and do.

CHAPTER 2

LITERATURE REVIEW

The current study centers around literature that examines theories about what education leaders do at all levels, the usefulness of standards for education leaders and teachers, and an examination of what standards are and how they are supposed to function. This chapter provides a path for investigating NGSS implementation in schools in a public school district in the rural South and the role that education leaders play in the implementation of NGSS by examining theories about what education leaders do, how standards are helpful to educators and education leaders, and by looking at what standards do. Additionally, these sections examine how each concept specifically connects to NGSS, and the methods administrators have used in the rural South to implement these standards within the classroom.

EBSCO, ERIC, and Google Scholar were used to identify studies that formed the basis of the literature review. The primary search terms used were NGSS, content standards, standards implementation, administrator implementation, leadership theory, standards response, and the purpose of the standards. Additional articles appeared by examining the references identified by the primary search.

Excluded articles resulted from their focus on teaching standards instead of the purpose of standards, focus on student expectations instead of content expectations, examining leadership without any context of standards implementation, explored leadership outside of the context of education, or were not available in English. Several excluded articles discussed higher education unless they connected directly to K-12 education in either theory or implementation. Other excluded articles included those older than 2005, allowing for an examination of modern standards while reducing the likelihood that irrelevant and outdated standards implementations do not directly influence the literature review.

The structure of this literature review explains the theoretical framework of distributed leadership and then connects the significant areas of research to show the need for understanding how the NGSS implementation in a school district in the rural South occurred. In order to fully understand this connection, the review examines theories about what leaders do and how they impact public schools. Next, the research explains what education standards are and how they impact learning. Finally, the literature review explores how standards are helpful for both leaders and teachers in education. This research's literature is substantial because it thoroughly examines the major areas covered and examines the complex relationships between these factors. A potential challenge of the literature is that many of the cases examined are subjective and may contain unintentional biases. Further study is needed to examine education leaders' roles in implementing NGSS adequately.

Theoretical Framework

Distributed Leadership Theory

Distributed Leadership Theory examines the mutual interactions of school leaders, their followers, and the different aspects of their specific situations (Spillane, 2006). Spillane rejects the concept of a school leader as a Superman figure and instead shifts the focus to the total leadership abilities of all leaders within the school. The limitations of the single-leader model have become more pronounced as more collaborative models have developed (Samancioglu et al., 2019). Spillane (2006) emphasizes that Distributed Leadership Theory consists of having the practice of leading as a central concern, that it stems from the interactions between all interested parties, and that the situation has a contingent relationship with leadership practice. Samancioglu et al. (2019) further define distributed leadership as mindfully delegating leadership roles to help reduce the workload on an individual leader, especially as it culminates over an arbitrary course of time. Leithwood et al. (2009) point out that while this delegation of leadership roles may lessen the workload on leaders, it does ultimately result in someone within the organization gaining an increased workload and also acknowledges that this additional work often makes many teachers feel greater empowerment and connection with the work they are doing.

Distributed leadership is not a standalone theory but instead an idea used in conjunction with other leadership theories (Leithwood et al., 2009; Samancioglu et al., 2019; Spillane, 2006). Spillane (2006) further expands on this idea when he points out that many leadership theories fail because they focus on the skills of an individual leader but that it fails to account for the fact that there is a balance between administrator skills,

teacher skills, and student abilities. As a result, distributed leadership focuses on the entire system and how standards function as a whole instead of focusing strictly on the principal's actions (Spillane, 2006). Finding the strengths among individual leaders and understanding the interactions within a school is essential to the successful use of distributed leadership (Samancioglu et al., 2019).

There are notable perspective differences between researchers regarding distributed leadership. Spillane (2006) focuses on distributed leadership as a theory that helps researchers better understand the role of a leader within a school. Leithwood et al. (2009) and Samancioglu et al. (2019) offer a more democratic view of distributed leadership as a group of administrators, teachers, and students working together to create a more effective system. While these differences are subtle, Spillane argues that distributed leadership alone cannot effect change but can help explain how the institution of those changes. Further, Leithwood et al. and Samancioglu et al. find that distributed leadership only works in conjunction with other leadership theories but can affect change within a school regardless of the use of a specific leadership theory.

One of the most widely used education programs grounded in distributed leadership is *The Leader in Me* (Covey et al., 2014). Covey et al. created *The Leader in Me* to help principals find the leadership skills present within every stakeholder at a school. Each stakeholder is tasked with their piece of the leadership framework and works together to accomplish goals instead of waiting for a task delegated to them by a principal. Covey et al. further clarify that the program follows distributed leadership ideas by pointing out that this is not simply giving teachers a specific job but giving them the skills to help change the entire organization.

With the focus of the research questions for the current study being NGSS implementation in a school district in the rural South and what roles education leaders played in that implementation, distributed leadership helped establish the connection between leadership roles and the successful implementation of NGSS. Distributed leadership is uniquely suited to establish connections between how school leadership distributed roles during the implementation of a new system, specifically NGSS, and the perception of education leadership within those schools studied in the chosen district (Leithwood et al., 2009; Samancioglu et al., 2019; Spillane, 2006). Distributed leadership connects theories about what education leaders do, how education standards are helpful to educators and education leaders, and what purpose standards have in the education of students.

What Education Leaders Do

Hoy and Tarter (2008) provide a balance of analysis, description, and prescription to establish what education leaders do and how their functions impact the school. While focused on administration, the concepts about these administrative roles and motivations are transferable to any education leader. This research is the culmination of several case studies that establish a connection between administrative decision-making theories (Hoy & Tarter, 2008). Further research centers around theories of leadership that are directly related to curriculum leadership and tied to the implementation of a curriculum (Glatthorn et al., 2019). They established their findings through several case studies that examine the role of many different types of school leaders ranging from administration to classroom leaders. Another prominent researcher examines leadership specifically from implementing the NGSS (Stiles et al., 2017). Stiles et al. created a framework with which

school leaders could assess their effectiveness at the implementation of NGSS by connecting leadership theories to interviews with school leaders that successfully implemented NGSS. Additional researchers support the findings of these significant researchers, which are supported within each topic by their relevant research.

Administrators Solving the Problems of Practice

An important component of education leadership is the role played by administrators on a school campus. Hoy and Tarter (2008) researched both the motivations behind education leadership and the leadership methods that clarify the role of a school leader. They further explored what techniques explain why school leaders make important decisions. Most of the case studies they examined occurred in public education, but the study included some private and alternative schools. As a result of the study, Hoy and Tarter established eight leadership models and the roles that each of those models has played in developing school leadership. The study is limited by its inability to study every possible school leadership model and every possible school environment for any of the models used in the referenced study. Hoy and Tarter imply that continual testing of the eight models in real-world situations within public schools is necessary.

Hoy and Tarter (2008) examined eight school leadership models and explain each style extensively. The Classical Model is rooted in the idea that leaders can optimize their decision-making process by always finding the single best solution to any given problem (Hoy & Tarter, 2008). Grant and Hartley (2013) warn that many education leaders will default to this model and find themselves reevaluating their leadership methods when they do not result in the desired outcomes. The Administrative Model seeks to create a means-end analysis to create a satisfactory outcome focused on the needs of the school

(Hoy & Tarter, 2008). Preedy et al. (2012) similarly refer to this leadership style as a Controller Leader. The most significant benefit of the Controller Leader is that it allows a school leader to identify a problem, create an action plan, and reframe the solution if the plan does not result in the desired outcome without gathering input from multiple sources (Hoy & Tarter, 2008).

Similarly, Mixed Scanning allows an administrator to focus on solving smaller pieces of the more significant problem and find the best plan to resolve the larger issue by slowly approaching the goal instead of trying to create a single solution to a complex problem (Hoy & Tarter, 2008). Hoy and Tarter also explore the Incremental Model that they more aptly refer to as the "muddling through" method. In this model, a school leader is working very similarly to Mixed Scanning, but since he/she cannot see a solution, he/she is fixing the problems he/she can fix and hoping the solution will reveal itself in the process. According to Hoy and Tarter, the least favorable methods presented are the Garbage Can Model and the Political Model. The Garbage Can Model occurs when a school leader makes decisions on a whim without considering how it might affect the school campus in the long term (Hoy & Tarter, 2008). Equally objectionable to Hoy and Tarter is the Political Model where school leaders do not work in the best interest of the campus but rather in the best interest of their objectives or for personal gain in either status or position. Uhl-Bien and Marion (2008) similarly found that these two models, though named differently, often result in inefficient workplaces.

Finally, two models exist that are simply variations of one model, the Shared Decision Making Model (Hoy & Tarter, 2008). The Shared Decision Making Model exists with a Comprehensive Model and a Simplified Model that are distinct enough to be

considered two separate models (Hoy & Tarter, 2008). Hoy and Tarter find that the Comprehensive Shared Decision Making Model allows for an increased number of stakeholders within the school to have a voice in the decision-making for every decision within the campus, which is unwieldy and difficult to accomplish. The Simplified Shared Decision Making Model allows leaders to determine which decisions would benefit from more stakeholder input and not require additional input (Hoy & Tarter, 2008).

Hoy and Tarter (2008) provide ample support for these leadership models and their findings, which are more effective at accomplishing the goals of a campus or district than others. They also provide a substantial overview of school leadership, but it is necessary to narrow the focus down to how education leaders play a role in implementing a curriculum. Glatthorn et al. (2019) provide valuable insight into a specific leadership category called curriculum leadership.

Curriculum Leadership

Another important component of education leadership is the role played by curriculum leaders on a school campus. Glatthorn et al. (2019) find that an effective school leader must prepare for curriculum implementation with three things in mind: types of curricula, reaction to the curriculum, and expected outcomes. Glatthorn et al. sought to discover fundamental leadership techniques in the supervision and implementation of a curriculum. The case studies public schools in the United States across all grade levels (Glatthorn et al., 2019). As a result of the study, Glatthorn et al. developed specific “leadership truths for curriculum leaders” essential for implementing any curriculum by any level of curriculum leader. Additionally, education leaders must understand the different curriculum levels to effectively use the leadership truths

established. Glatthorn et al. value the idea that education leaders should test their implementation rules in real-world situations.

Glatthorn et al. (2019) examine critical components of the curriculum that establish the leadership truths for curriculum leaders and help tie which of those truths connect to each curriculum component. A key component of the curriculum is the recommended curriculum, which establishes content without consideration of time or ability. The next key component of the curriculum is the written curriculum which establishes a synthesis of the recommended curriculum tied to the local focus of practice. The supported curriculum identifies the resources provided by the district or school to allow the delivery of the curriculum. Glatthorn et al. next clarify the taught curriculum, which exists as actions within a classroom of how a teacher presents the material. One of the most vital aspects of curriculum leadership is understanding the tested curriculum, identified by how a teacher assesses the material and the structured, standardized test. Finally, all previous aspects culminate in the final component of the curriculum, which is the learned curriculum that establishes what students understood and learned from being educated.

DeMatthews (2014) supports these ideas about curriculum leadership, finding that it is necessary to set the direction of campus goals, organize teachers and staff, and align curricula to standards. Education leaders' efforts require a distributed approach to leadership because any given individual leader does not generally possess complete knowledge and experience on any topic. Parkes (2013) researched the effect of focusing on curriculum leadership in the training of education leaders and found that an education leader must provide a focused theory upon which all other leaders function within the

school. By providing this theoretical groundwork, curriculum leaders can work in lockstep to create a function within the critical components of the curriculum (Parkes, 2013). An education leader needs to help others understand their roles in developing their responsibilities to act as leaders of smaller and smaller groups to help a school achieve implementation goals (Schwartz & Ticknor, 2017). In addition to creating schools that are more aligned with implementation goals, teachers with significant leadership roles have greater degrees of confidence in their abilities (Schwartz & Ticknor, 2017).

Glatthorn et al. (2019) provide significant support for their multiple components of the curriculum and the steps that school leaders should follow to provide appropriate support for the implementation of a curriculum. Glatthorn et al. provide a well-researched set of applications for school leaders to consider during curriculum implementation, but focusing on implementing the NGSS is also needed. Stiles et al. (2017) provide this additional needed focus on NGSS implementation by directly studying campuses that have participated in the implementation of NGSS.

Leadership Roles for Next Generation Science Standards

An additional component of education leadership is the role played by leaders during the implementation of NGSS specifically. Stiles et al. (2017) state that their research question is “What do leaders need to know and be able to do in order to lead the implementation of the Next Generation Science Standards (NGSS)?” This mixed-methods study focuses on K-12 education for public and private schools in the United States. Stiles et al. establish critical domains for school leaders during the implementation of NGSS and the components of each of those domains. Stiles et al. identify the key domains that school leaders must focus on during the NGSS implementation. Stiles et al.

suggest that further study should test their framework by examining specific implementation cases.

While the study is well researched and has a high level of trustworthiness, it is essential to note that WestEd, the organization that created the NGSS, provided funding (Stiles et al., 2017). Their research establishes that an essential domain for implementation of NGSS is Leadership Knowledge, which requires education leaders to understand the research behind NGSS, provide equity for all learners, provide appropriate instructional materials, provide professional learning opportunities, and be change leaders. Another essential domain for implementation of NGSS is Critical Actions, which includes aligning policy, appropriate funding, assessing the system in which NGSS is operating, building a shared vision, providing adequate professional development to education leaders, and using data to examine outcomes. Lotan et al. (2019) found that effective professional development for NGSS centers around training led by colleagues and not by outside consultants. An additional essential domain for implementing NGSS is Impacting Teaching and Learning, simply considering system drivers and ensuring they are functioning as intended by the three domains of NGSS (Stiles et al., 2017). The final essential domain for implementing NGSS is Sustaining Implementation, which examines the practices, people, processes, and policies to ensure that they all maintain fidelity to the other three key domain. Education leaders must be cultivated carefully and given the freedom to develop proper alignment by current leadership (Lotan et al., 2019).

Summary

Several key features develop from the literature surrounding education leadership. The purpose of education leaders is to act as decision-makers on their campus (Glatthorn

et al., 2019; Hoy & Tarter, 2008; Stiles et al., 2017). Additionally, leaders must effectively use the talents of every member of their teams to help create better outcomes that align with the campus goals (Glatthorn et al., 2019; Hoy & Tarter, 2008; Stiles et al., 2017). Finally, education leaders must understand the purpose of standards to play a meaningful role in implementing curricula (Glatthorn et al., 2019; Hoy & Tarter, 2008; Stiles et al., 2017).

These findings fit well with Distributed Leadership Theory because they all connect to how education leaders use the leadership resources available on their campuses to help achieve their goals (Spillane, 2006). Additionally, Distributed Leadership Theory assists in understanding the motivations of leaders that were studied and establishing how these researchers' findings led to the desired outcomes of their campuses or districts. Further research is needed to connect each of these concepts to the NGSS and education leaders' roles in its implementation.

Educational leaders acting as decision-makers on their campuses is well supported by the research. Hoy and Tarter (2008) find that education leaders' priorities are crafting decisions based on the clever use of decision-making theories. Further, leaders within a district must be identified to allocate resources to those leaders who work toward the district and school goals (Glatthorn et al., 2019). Leaders further need a deep understanding of curricula and standards to ensure proper alignment to the standards within the classrooms on their campuses and in their districts (Stiles et al., 2017). It is vital to understand that education leaders are not limited to administrators and that teachers play vital roles in education leadership (Harrison & Birky, 2011). Sherman and MacDonald (2008) find that school leaders, specifically principals, play vital roles in

supporting teaching and how they perform their roles as leaders provide vital insight into how teachers present material within the classroom. Despite principals playing significant roles, teacher leaders play prominent roles in developing organizational goals and are essential in creating institutional changes (York-Barr & Duke, 2004). Educational leaders find themselves moving their leadership mindsets from strictly acting as managers to alternative roles, specifically as instructional leaders (Winn, 2016).

Creating more substantial outcomes by aligning standards to campus goals is also well supported by the research. Glatthorn et al. (2019) find that successful program evaluation and assessment requires a link between education leadership and the objectives and goals of the district. Further, education leaders need to understand that setting objectives and planning to guide decisions toward those objects is necessary for successful programs (Hoy & Tarter, 2008). Stiles et al. (2017) also concluded that education leaders must clearly state their expectations of how others are aligned to achieve campus and district goals. It is vital for the achievement of goals of a school campus that education leaders inspire others to move toward the goals of their schools while understanding the importance of the district goals (Harrison & Birky, 2011). Goddard et al. (2010) found that an effective way to connect teachers to the goals of the campus is to encourage collaboration. Education leaders help establish influential leadership roles by identifying teachers with exceptionally high pedagogical knowledge of their content areas (Sherman & MacDonald, 2008).

The need for education leaders to understand the purpose of standards is well supported by the research. Stiles et al. (2017) establish that education leaders must articulate outcome expectations by tying them to the standards presented in NGSS.

Standards-based goals allow education leaders to connect what students learn in the classroom to expected outcomes (Hoy & Tarter, 2008). Glatthorn et al. (2019) point to the importance of a leadership team reflecting upon the state standards to establish if the results achieved match the desired results of the campus or district. Education leaders must adapt to the new standards-based era by adapting to the different levels of implementation at the school level for curricula similar to NGSS (Winn, 2016). Additionally, education leaders must understand the operational meaning of standards and how standards-based reforms work in a school setting (Shepard et al., 2009).

These findings about education leaders focus on the importance of understanding the purpose of standards, but this creates a new research pathway: What exactly is the purpose of education standards? These researchers lead to a more robust understanding of what education leaders do and how they affect school outcomes, but it is necessary to establish the role and definition to explore these leaders' roles in implementing NGSS adequately (Barton, 2009).

The Purpose of Education Standards

Barton (2009) clarifies what standards intend to accomplish. This research focuses on developing national standards and how they intend to generalize more significant concepts across K-12 education. Multiple studies were analyzed to clarify the different methods and opinions surrounding the development of standards in education. Further clarification of their purpose exists in studying standards as an implicit or explicit call for change in education (Hamilton et al., 2008). Hamilton et al. establish their findings by analyzing multiple studies to create general conclusions about the purpose of standards as a change agent to help identify and fill gaps in societal needs. Another

essential researcher examines standards as a roadmap for educators and education leaders (Lauer et al., 2005). Lauer et al. synthesize their research through a systematic review of studies examining how standards impact classroom instruction.

National Standards

An important component of understanding the purpose of standards is to examine how standards have functioned on a national scale (Barton, 2009). Barton researched the precise definition of standards from the views of both advocates and detractors of standards usage and explored commonalities that can help in standards development. Barton explores the necessity of the United States using standards to clarify the definition of a standard. All of the studies examined were rooted in public education within the United States. Barton provides a general definition of standards as consensus from teachers about what students should learn in the classroom. Barton establishes that national standards create homogeneity between subject content across a diverse geographical landscape. The study is limited in that the researcher cannot study every potential state and national standard system ever used in the United States. Barton suggests that future research could help clarify the definition of a standard and explore the purpose of national standards more deeply as they develop beyond the scope of NCLB.

Barton (2009) establishes his definition of a standard and examines the disagreements between those who support and oppose standards on a national level. The main opposition to nationalized standards is that the United States is too large and has too many regional differences to create standards that work for every student in every district. Barton concludes that nationalized standards can be practical if states agree to create tests

compared with the National Assessment of Educational Progress (NAEP) and overseen by content creators who work outside the NAEP organization. The study reiterates that the preference for or against national standards becomes a moot point because of the passage of NCLB, which mandated them on a national level.

Barton (2009) further researched the actual purpose of a standard as generalizing more significant concepts across the entirety of K-12 education. The study found that a simple explanation of the purpose of any single standard was complicated because it contains many facets such as accounting for regional differences, the equity of opportunity to learn, and the levels of achievement possible for a given standard. One of the significant findings of the study is that without generalizations of larger concepts, states across the United States were teaching similar material at different grade levels and that students transferring across state lines were potentially at a significant disadvantage when compared to student achievement among those with low mobility. Additionally, students from low-income and low socio-economic schools are more likely to have fewer highly effective teachers, and these standards can help direct teachers to appropriate topics and methods for introducing them (Hilty, 2019; Lenz et al., 2015; Williams et al., 2005). Barton finds that a national set of standards creates a far more equitable education system as long as the states use them to focus on a content model and not a model for what needs testing when it becomes necessary to hold teachers accountable for the content of their lessons. Barton further finds that standardized tests should be developed around an agreed-upon national set of standards, not that standards should develop around an agreed-upon standardized test.

Barton (2009) developed approaches to creating and implementing a national set of standards. The Whole Enchilada consists of the federal government mandating a specific set of standards on all states and creating a national standardized test to establish accountability. This approach has been used extensively in other countries, such as Norway, with mixed findings on improvements in standardized testing (Camphuijsen & Levatino, 2021). If You Build It, They Will Come functions by having the federal government establish national standards and incentivizing states to adopt them voluntarily (Barton, 2009). Such incentivization has potentially increased standardized testing scores (Hout & Elliott, 2011). One challenge discovered in this system was the potential for students to be pressured into alternative pathways or into dropping out of school to prevent low-scoring students from taking the tests and hurting potential incentives (Stern, 2007). Barton (2009) calls the next approach Let's All Hold Hands, which requires that the states all come together and develop an agreed-upon set of standards without direct intervention by the federal government. The United States adopted this approach to implement Common Core in public education (Smith & Thier, 2017). The final approach is Sunshine and Shame, which calls for states to develop standards independently and create a system that allows the federal government to compare them and rank states based upon their findings (Barton, 2009). This approach was the methodology of the United States during the implementation of NCLB (Wanker & Christie, 2005).

Barton (2009) provides a great deal of support for his approaches and the identified purposes of standards. Further research into these approaches by examining Education leaders' attitudes toward national standards and implementing them on a

school campus would be beneficial. Barton provides a well-developed overview of how standards generalize topics, but it is also necessary to examine them as a call for change within education. Hamilton et al. (2008) provide research into standards as a call for change.

Standards-Based Reform

Another important component of understanding the purpose of standards is to examine how standards are used to implement education reform. Hamilton et al. (2008) establish that standards are at the center of a movement known as standards-based reform, which exists to redirect education to better reflect the best practices of the citizens of the United States. Hamilton et al. researched standards-based reform in the United States and established how it created a call for change in education. Their research question centers on how standards in conjunction with a curriculum lead to changing the content to improve student learning. The majority of the studies examined were conducted in public schools in the United States, though a small number examined private schools. The study's most significant limitation is that not all grades within public schools participated in testing, so it is difficult to establish the effectiveness of change in grades and subjects that are not bound to standardized testing. Hamilton et al. further find that another limitation of their study is focusing on math, English, and science standards and finding very little focus on other subjects. Hamilton et al. suggest that future research could help improve standards-based reforms by including decision-makers in developing these systems and studying any improvement in standardized testing after implementation.

Hamilton et al. (2008) define standards-based reform as an attempt to mold education to fit the needs of students better by fulfilling a necessary demand by society. Standards-based reform is a powerful change agent across all levels of education, but the implementation has not fully met society's expectations on education. Nolet and McLaughlin (2005) point to what they consider an even more critical connection between standards-based reform and improving the educational environment for students with disabilities. Educators report tremendous success with standards-based reforms the longer they work under a system that has implemented standards-based reform (Loeb et al., 2008). Hamilton et al. (2008) conclude that standards as a call for change have two potential paths to success and that either path must use the power of the federal government carefully to help reduce resistance from stakeholders.

Hamilton et al. (2008) developed these paths for using standards-based reform to use standards as a call for change effectively. The first approach improves existing standards and standardized tests. This approach requires experts from both state governments and private agencies to work in conjunction to establish the skills needed for success after high school, both in post-secondary education and in the workforce. Similarly, these groups could be used to develop standardized tests that better reflect the demands of society upon education and refocus the data generated by these tests as more than just a score on a test to rank students. Previous attempts of this method in public education occurred by teaming up experts in K-12 education with experts in higher education to establish norms for preparing students as they work through a curriculum (Moore et al., 2014). Alternatively, Hamilton et al. (2008) offer a second approach in which states create more effective standards by incentivizing research that addresses the

shortcomings of current accountability systems. Hamilton et al. find that the current state of education, which focuses on students achieving benchmark goals on standardized tests, does not align with the true goal of education. The true goal of education being a focus on growing student knowledge regardless of the student's starting point. Hamilton et al. find that for standards-based reform to be truly effective, the standards must be independent of standardized testing. Research shows that tying standardized testing to standards-based reform with NCLB resulted in steady and occasionally significant increases in student retention (Hauser et al., 2007; Penfield, 2010).

Hamilton et al. (2008) establish support for their approach to standards as a call for change by society. Further research into standards-based reform by examining the attitudes of school leaders about the effectiveness of standards in the classroom would be potentially beneficial. Hamilton et al. provide a substantial overview of how standards-based reform allows standards to act as a call for change but find that it is also essential to examine standards as a roadmap for educators. Lauer et al. (2005) provide additional research that helps establish standards as a practical guide to help educators determine the most effective path needed for their courses to cover the material adequately as defined by their state boards of education.

Influence of Standards on Course Design

An important component of understanding the purpose of standards is to examine how standards have influenced course design. Lauer et al. (2005) researched the direct influence of standards on how teachers approach student learning and design how they teach subjects within their classrooms. The research question focused on establishing if standards are practical tools for educators to use as a roadmap for teaching. All the

studies examined for this research occurred in public schools in the United States in grades that use standardized testing. Lauer et al. establish that standards work effectively as a roadmap for education but have a weak positive correlation unless the educator receives proper professional development on correctly using the standards given to them. Lauer et al. establish several limitations in their study, including the dependence of results on how outcomes are measured, overestimation by educators about their appropriate usage of standards, and a disparity between standardized testing and the goals of standards. Lauer et al. believe that future research should focus on a broader set of potential influences on outcomes by comparing groups that receive treatment to others that do not receive treatment.

Lauer et al. (2005) find that standards intend to be a guide to help an educator understand all the ideas that a student should understand by the time he/she completes each specific course. Not only do standards guide teachers about what to teach, but also they also act as a guide for how meaningfully a student should understand the material. Lauer et al. conclude that standards effectively changed course material organization and presentation, aligning with the intent of standards to act as a roadmap for educators. Similar studies have found that standards improved the teacher perception of the effectiveness of high school instruction (Millar, 2006).

Lauer et al. (2005) determined that standards-based instruction can improve achievement, primarily when centered on higher-order thinking skills. Additionally, classrooms have undergone a focus shift due to education standards. Lauer et al. establish that the full effect of standards on this shift is difficult to quantify because of the vast number of potential approaches within a classroom. Additionally, most of the

measurement tools used to establish teacher accountability are incompatible with standards to push students toward ambitious learning goals. Cochran-Smith et al. (2013) additionally establish that this disconnect between standards and accountability is unavoidable because of the political nature of both education standards and teacher accountability.

Lauer et al. (2005) provide support for examining standards as a roadmap for educators to develop course progression. Further research into this concept should include examining the perspectives and attitudes of school leadership about the usefulness of standards in guiding the development of courses in public education. Examining the attitudes of school leaders would provide a richer understanding of standards and how they can impact the development of these courses.

Summary

Standards generalize larger concepts to assist education leaders in knowing what to teach and where those topics belong as students progress from grade to grade (Barton, 2009; Hamilton et al., 2008; Lauer et al., 2005). Standards also act as a call for change in education (Barton, 2009; Hamilton et al., 2008; Lauer et al., 2005). Additionally, standards act as an educational roadmap to guide teachers through the progression of their specific courses (Barton, 2009; Hamilton et al., 2008; Lauer et al., 2005).

These ideas developed through several case studies that established findings through synthesis, but additional research supports these researchers. Further research is needed to connect these findings specifically to the NGSS and education leaders' roles in its implementation. These findings all fit well with Distributed Leadership Theory because they connect between what leaders do and what standards are. Distributed

Leadership Theory also provides a potential motivation for education leaders to understand standards to help them become more effective education leaders.

Standards helping generalize concepts to assist education leaders is well supported by the research. Standards provide a valuable function by generalizing topics to assist education leaders in establishing topics that need to be focused on to increase success on standardized testing (Barton, 2009). Standards also provide steps to assist education leaders with aligning curriculum with school goals (Hamilton et al., 2008). Lauer et al. (2005) find that schools experience increased student performance on standardized tests when standards align with assessments, instruction, and professional development. A connection between standards and student performance exists, which provides evidence that education leaders must be aware of what a standard is and how it helps steer the district's goals toward the school's needs (Goodman, 2012).

The research also supports that standards call for change in education. Standards were created initially as a call for change by focusing on a systematic approach to improve student achievement (Hamilton et al., 2008). Standards-based education also works as a call for change in the accountability system for educators, and education leaders must understand how this creates opportunities and barriers for the teachers on their campuses (Lauer et al., 2005). Barton (2009) emphasizes that standards did not originate specifically as a national call for change but that they have developed into an attempt at standardizing education on a national scale. Dunkle (2012) finds that the increased demand for accountability helps education leaders shift instruction to match the demands of the standards. Understanding these calls for change became even more

critical as federal funding became tied to implementing standards, and schools failing to adopt these standards risked losing millions of dollars (Jorgenson & Hoffman, 2003).

Standards acting as a roadmap for teachers is also well supported by the research. Barton (2009) frames standards as a guide to help teachers know what to teach in their classes, how to teach the topics intended to be covered, and how to test those standards effectively. Further, standards do not simply act as a guide for teachers but also assure that local discretion over curriculum will not deviate from the intended path for a given course (Hamilton et al., 2008). Lauer et al. (2005) expand upon the idea of standards as a roadmap by examining them as guides for not only what to teach but for teachers to establish the most effective instructional choices within their classrooms. Standards have helped provide many courses that allow education leaders to understand the progression differences between an effective classroom and a classroom functioning without clarity (Vlachopoulos, 2016).

Each concept covered provides a clearer understanding of how a standard functions. It is vital to establish standards for education leaders to adequately incorporate them into their leadership decisions (Hamilton et al., 2008). However, it is necessary to understand what an education standard is and how they are helpful for education leaders. Therefore, a new research pathway is necessary to understand how education leaders use standards to make informed decisions within public education (Glatthorn et al., 2019).

The Usefulness of Standards for Education Leaders

Glatthorn et al. (2019) examines how education leaders use standards to align with a district's vision. Glatthorn et al. establish their findings through several case studies that examine methods for aligning district goals with the goals of individual

courses. The usefulness of standards for education leaders is expanded further by examining how it assists in collecting data within the classroom (Boudett et al., 2015). Boudett et al. established their findings by synthesizing multiple studies on how to tie classroom assessments to standards and use the results to improve education. Further vital research examines using standards as a means to set goals within a classroom and on a school campus (DeMink-Carthew et al., 2017). DeMink-Carthew et al. establish styles of goal setting using standards through a qualitative analysis of middle school teachers.

District-Level Decision Making

An important component of understanding the usefulness of standards is to examine how standards have assisted districts in decision making. Glatthorn et al. (2019) establish that standards are essential for aligning courses with the district's vision. The research question centers on how standards can align the district vision with the content taught in the classroom. The case studies used in this research were all conducted in public education within the United States. Glatthorn et al. explain the process of aligning district goals with the multitude of courses offered and how it ties to a goal-based planning model. Glatthorn et al. further explore practical methods for establishing district goals and how to create systems that use the standards to help align courses with those goals. Glatthorn et al. are limited by the impossibility of replication of the study because the events have already occurred.

Glatthorn et al. (2019) establish critical questions that education leaders should approach in creating district goals using education standards. The district-level goals do not have to be broad, as standards help districts establish goals among specific subgroups of students, especially in special education programs (Brownell et al., 2005; Epler-

Brooks, 2019; Leko et al., 2015). Once the standards have helped align the district goals, they can help develop curricula for content areas designed to be standards-aligned and push stakeholders toward the district's overall goals (Glatthorn et al., 2019). Glatthorn et al. additionally developed a tool to provide a correlation analysis of what is taught in classrooms to help leadership establish connections between the standards and district vision.

Khoza (2016) supports the importance of aligning goals with the school vision, resulting in a higher perception of student success. Glatthorn et al. (2019) expand the concept further by focusing on issues that must be addressed by a district when aligning district goals with education standards. A significant issue is goal alignment, in which the district examines how well the programs of study reflects the school district's vision. Another major issue is a correlation in which the district leadership must establish the level to which courses must correlate with each other as a student progresses from one grade to another. Elmesky (2012) found that this type of step-by-step alignment helped teachers better understand the developmental abilities of their students.

Next, Glatthorn et al. (2019) focus on resource allocation, where educational leaders must establish how many resources they are willing and able to allocate to a program to better align with the district's vision. Kantabutra (2005) finds that schools that allocate resources to their programs tend to have more successful programs. The next major issue is learner needs, which require education leaders to examine how well the courses of study respond to student needs both currently and in the future (Glatthorn et al., 2019). Focusing on both future and current student needs has increased the perception of student success by teachers and the general public (Noddings, 2005; Sheehan, 2011;

Tomlinson, 2016). Finally, Glatthorn et al. (2019) point to the importance of constituent satisfaction, which examines how well all of the stakeholders in a district respond to the district's goals and how to present those goals in the classroom. Professional development centered around helping teachers connect standards and district goals has increased teacher satisfaction and willingness to implement these goals in the classroom (Allen & Penuel, 2014; Levine & Marcus, 2007; Penuel & Gallagher, 2009).

Glatthorn et al. (2019) separate the concepts of standards and curriculum, pointing out that curricula are products of standards. For this reason, education leaders must be mindful when aligning district goals to understand that courses are not guided by the curriculum but rather by the standards with which the curriculum should cover. Brass (2014) clarifies this idea by reiterating that standards should not be considered separate from the curriculum but rather that they are two different concepts that both serve to guide student learning efficiently and effectively. Glatthorn et al. (2019) expressly point to tying the district's goals to standards and standards alone. Once a district is ready to expand into the establishment of a curriculum, it must have completed the process of standards-goal alignment first or risk developing curriculum-based goals and not standards-based goals.

Glatthorn et al. (2019) provide significant support for the connection between education standards and appropriate development of district goals. The research could expand by examining how school-level leaders use standards to evaluate the alignment of courses taught at the campus level. Glatthorn et al. provide a well-researched theory of connecting standards to the district vision but focus on how standards allow for more

effective data collection processes is also needed. Boudett et al. (2015) focus on the connection between standards and data collection.

Education Leadership Data Usage

An important component of understanding the usefulness of standards is to examine how standards help education leaders examine student performance. Boudett et al. (2015) find that standards are an important component of data collection for education leaders. Boudett et al. attempt to find out how standards assist with evaluating educational needs using data. The researchers synthesize data from multiple case studies primarily conducted in public education within the United States. Boudett et al. developed a process of using data in conjunction with standards they term as the ACE Habits of Mind, which stands for Action, Collaboration, and Evidence. Every action taken by an education leader must focus on standards-based objectives that integrate questioning, analyzing, and making decisions structured solely around moving stakeholders toward the requirements of the standards. Boudett et al. have a limitation in that all of the case studies analyzed occurred in scenarios that have already happened and would not be possible to replicate. Boudett et al. imply that researchers should continue to work with the findings of their study and test outcomes from the usage of the ACE Habits of Mind.

Boudett et al. (2015) establish a model for education leaders to use centered around examining data with the standards in mind. This model contains steps structured in three main categories: prepare, inquire, and act. The first category in which an education leader is preparing includes organizing collaborative work and building personal literacy in assessing standards. This category is a necessary and essential aspect

of training teachers on how to best implement formal and informal assessments in a standards-based classroom (Gregory & Kuzmich, 2014). The next category of inquiry requires education leaders to create data overviews, dig into the data collected, and examine how instruction affects outcomes (Boudett et al., 2015).

Many data collection methods exist in the classroom, and education leaders must find the collection method most beneficial for their campuses (Del Blanco et al., 2013). Finally, the category in which education leaders act upon their inquiries requires them to create an action plan, develop a plan to assess that action plan's progress, and then act upon and access their findings (Boudett et al., 2015). Again, many approaches exist to create an effective action plan for specific needs of the campus, but the standards must establish that plan, have the plan arrived at from actual data, and result in a plan that is not influenced by teacher beliefs and observations, which might contradict the data (Bush & Cook, 2019). Boudett et al. (2015) reiterate that this process is intended to be and is necessarily iterative and that once an education leader has completed the circle, the entire process should start again.

Boudett et al. (2015) focus on the idea that this data collection needs to be standards-driven to help education leaders focus on the right things when attempting to make changes on campus. Many modern standardized assessments are standards-based tests designed around content and performance standards. Education leaders must understand that the basic idea of standardized testing is to establish a student's proficiency level and infer his/her understanding of the material (Hudson, 2012). Education leaders must understand how assessment construction helps train teachers to reflect those differences in their in-house assessments (Boudett et al., 2015). Boudett et

al. further find that many education leaders attempt to circumvent the system with practices that have questionable ethics but provide additional research that shows a strong positive correlation between student outcomes and educators focused on understanding the standards that develop the standardized testing. In some districts, administrators have even gone as far as encouraging students to drop out of school to avoid having the student test, which is counter to the purpose of using standards to drive instruction and helps all students work toward district goals (Kralovec & Buell, 2005).

Boudett et al. (2015) provide ample support for their findings regarding the critical connection between understanding the education standards and examining the data to help drive decision-making by educational leaders. This research could be amplified by looking specifically at how education leaders' understandings of the standards have influenced their decisions about changes when implementing the usage of NGSS. Boudett et al. establish the importance of connecting standards and data, but a further understanding of standards is needed to connect to goal setting. DeMink-Carthew et al. (2017) help establish how standards help education leaders set specific goals for their districts, campuses, and classrooms.

Leadership Approaches to Goal Setting

Another important component of understanding the usefulness of standards is to examine how standards allow leaders to set goals (DeMind-Carthew et al., 2017). DeMink-Carthew et al. find that standards are essential in creating educational goals. Two research questions exist, one identifying the ways middle school teachers approach goal setting and another looking at how those approaches intersect with personalized learning. The study is a qualitative analysis examining attitudes of middle school teachers

in Vermont. DeMink-Carthew et al. developed approaches to goal setting that all center around how teachers incorporate standards, among other potential factors. DeMink-Carthew et al. never directly address the limitations of their research but are limited by the small sample size and the limited setting of their study. Suggested future research includes the possibility of a longitudinal study of how goal-setting styles change over time or examining the challenges faced by teachers as they attempt to set goals for their classes.

DeMink-Carthew et al. (2017) establish approaches to goal setting, and each level depends upon standards. Independent Design is distinct in that it does not take standards into account and is strictly based upon students' desires but does not tie these goals to topic development. Interest Driven Co-Design functions by developing goals based upon the interests and desires of students and tying those classroom goals to the expected outcomes of the classroom. Next, Interest and Skill Driven Co-Design is when students develop interest-based goals and then tie them to the expected outcomes based on educational standards. Skill Driven Co-Design occurs when teachers provide students with a series of standards-based topics, and the students make goals based upon their interests in other cross-curricular standards that they believe would enhance their learning. The final approach derived from the study is Selection, in which the teacher developed goals for students based upon the standards.

DeMink-Carthew et al. (2017) provide findings well supported by the study's research design. This research could expand by examining how education leaders use these approaches to develop their own teaching goals and assist teachers in designing goals aligned to the specific implementation of NGSS. Examining these methods in the

context of education leadership could provide a more refined understanding of the importance of tying standards-based instruction to implementing a specific curriculum such as NGSS.

Summary

Standards help align instruction with the district vision (Boudett et al., 2015; DeMink-Carthew et al., 2017; Glatthorn et al., 2019). Additionally, standards provide vital data for education planning (Boudett et al., 2015; DeMink-Carthew et al., 2017; Glatthorn et al., 2019). Finally, standards provide education leaders with essential tools for goal setting (Boudett et al., 2015; DeMink-Carthew et al., 2017; Glatthorn et al., 2019).

These ideas developed through multiple researchers, but additional research supports their findings. Further research is needed to better connect these concepts specifically to the NGSS and education leaders' roles in its implementation. These ideas all fit well with Distributed Leadership Theory because they establish the usefulness of standards to education leaders, which can help these leaders find the best roles for the people on campus. Distributed Leadership Theory also provides a more refined understanding of how standards are helpful to evaluate decisions by education leaders.

Standards assisting education leaders in aligning classrooms with the district's vision is well supported by the research. Standards provide a clear pathway for aligning school goals with the district vision in the short-term, medium-term, and long-term (Boudett et al., 2015). National standards allow school leaders to align their goals with the district and help ensure that implementation and professional development assisting with implementation remain aligned with the district vision (Glatthorn et al., 2019).

DeMink-Carthew et al. (2017) find that the district vision is further enhanced by standards when connected with established cross-curricular connections. Standards assist education leaders with not only aligning to the district vision but ensuring that the alignment to that vision is not simply meeting the minimal standards necessary to technically achieve that alignment (Schmidt-Davis & Bottoms, 2010). Additionally, adhering to standards to help align with the district vision can increase teacher commitment to tying the vision to the learning process (Kurland et al., 2010).

Standards provide a medium for analyzing performance using data, which is also well supported by the research. Since standards guide the development of state assessments, education leaders can analyze the material for proper alignment of subjects taught in the classroom with the expectations of the standards-based assessment (Boudett et al., 2015). As education leaders, teachers, and students use standards to guide learning throughout the year, the data allow them to establish the level of success both holistically and individually (DeMink-Carthew et al., 2017). Glatthorn et al. (2019) also find that creating a culture that embraces data allows education leaders to review not only the material presented but the methods being used to deliver that material. Connecting the standards to collected data also allows education leaders to establish effective variations in teaching styles (Barton, 2009).

Standards providing practical goal-setting tools for education leaders is also well supported by the research. Goal setting allows education leaders to define success in the classroom and has positive perceptions from teachers and students (DeMink-Carthew et al., 2017). The improvements that schools see from the standards-based goals can take significant periods, and education leaders must take this into account as they develop

these classroom goals (Boudett et al., 2015). These standards-based goals must also focus on tying collected data with the district vision (Glatthorn et al., 2019). Education leaders must examine their state-specific standards when establishing goals because the requirements often differ from state to state (Stecher & Naftel, 2006). Additionally, standards-based goals for individual students, especially those requiring an Individualized Education Plan, may help reach academic goals and help students accomplish significant gains in their personal goals (Smith, 2013).

Each concept covered provides a refined understanding of how standards are helpful to education leaders. It is essential to establish the usefulness of standards for education leaders to help direct decisions that affect the implementation of standards on a school campus. A well-established connection exists between what leaders do, what standards are, and how education leaders use standards. However, a more direct examination of these connections, specifically in the implementation of NGSS, would create an even richer understanding of these connections.

Summary

Education leaders at all levels need to understand the different leadership roles needed to cultivate a successful implementation of the NGSS (Stiles et al., 2017). Understanding the role of education leaders, the function of standards, and the usefulness of those standards to education leaders is vital for planning the implementation of a new curriculum. Education leaders who understand the different roles they play on school campuses are better able to effectively plan for a standards-based curriculum implementation (Glatthorn et al., 2019; Hoy & Tarter, 2008), which holds for not just a generic standards-based curriculum implementation but specifically for the

implementation of the NGSS (Stiles et al., 2017). These skills are enhanced by understanding the purpose of standards to assist education leaders in establishing the expectations within a standards-based curriculum (Barton, 2009; Hamilton et al., 2008; Lauer et al., 2005). Tying the use of standards to the roles of education leaders further clarifies not only how to implement a standards-based curriculum but also how the different types of education leaders play different roles in that implementation (Boudett et al., 2015; DeMink-Carthew et al., 2017; Glatthorn et al., 2019).

While some inconsistency exists within the literature about the roles of an educational leader or the purpose of standards, disagreement exists about the use of standards for an education leader. Most of the research examined in the literature results in a belief that standards help guide education leaders toward a focused goal for the implementation of a standards-based curriculum (Barton, 2009; Boudett et al., 2015; DeMink-Carthew et al., 2017; Glatthorn et al., 2019; Hoy & Tarter, 2008; Lauer et al., 2005; Stiles et al., 2017). Hamilton et al. (2008) find that using standards to direct curriculum implementation can result in education leaders pushing teachers to focus more on testing outcomes than what is best for students. Stiles et al. (2017) specifically address this concern related to the NGSS by pointing out that standards-based testing and a standards-based curriculum is not simply a set of facts to learn but guides education leaders toward the best path for students to learn the material.

Stiles et al. (2017) find that there still exists a need to examine the roles that education leaders play in implementing NGSS. Examining the roles education leaders have played in implementation can help create a more refined idea of what steps future leaders should consider taking and considering how those education leaders used the

implementation of NGSS to guide teachers toward the goals of their districts (Stiles et al., 2017). Stiles et al. suggest that further case studies will provide the most valuable insight into this process and allow education leaders to consider their roles within their districts when implementing NGSS.

CHAPTER 3

METHODS

The problem addressed in the current study was the connection between the nature of engagement of education leaders and the implementation of the NGSS in K-12 public education (NGSS, 2013). There were two Research Questions studied:

RQ1: *What roles have education leaders played in middle schools implementing NGSS?*

RQ2: *What are the teacher perceptions of the role of education leaders in NGSS?*

Methodology

This chapter examines the methods involved in conducting this research. Included is an examination of the study's overall design, including methodology and research tools. Additionally, this chapter explains sample selection, data collection, and data analysis. Finally, descriptions of validity and reliability, researcher positionality, delimitations, and research limitations exist in Chapter 3.

Research Design

The current study was an instrumental qualitative case study with embedded cases attempting to find a richer perspective of what roles education leaders take on while facilitating the implementation of NGSS and how the roles of an education leader affects teachers' perceptions of the successful implementation of NGSS. For this research, the

case unit was the public school district, and the embedded units were the individual schools functioning within that public school district. The current study was instrumental because the embedded cases help contribute to theory. The research has some utility and generalizability but ultimately provided a clearer picture of NGSS to assist researchers in obtaining a more precise understanding of implementation (Stake, 2010).

The underlying philosophy of the current study was constructivism, the belief that knowledge is an understanding of conceptual ideas and not purely rigid facts (von Glaserfeld, 1998). The study was qualitative because it ties instructional leader perspectives of the implementation of NGSS to the levels of their leadership support. Further, the study was a case study because it examined the attitudes of instructional leaders in a precise geographical location, and Stake (2010) described a case study as a specific group studied for a particular reason. Yin (2018) further identified a case study as an investigation conducted within a real-world context. Stake (2010) explained that case studies generally do not include campus connections. However, the current study was still a case study because those connections are limited to one independent district. This idea is further supported by Merriam (2009) because the current study wa s an in-depth study of a bounded system. This case study tied together multiple embedded cases, which Yin (2018) further supported as a case study with subcases embedded within the more extensive case study.

Case Selection

The case for the current study was a rural public school district in a southern state in the United States that has implemented NGSS. The embedded units were three middle schools in the school district that represented a diverse population and covered multiple

socioeconomic classes. These middle schools had achieved the same School Performance Score after implementation of NGSS, which allowed the researcher to develop a deep understanding of implementations of NGSS across multiple school contexts. The schools needed to have attempted the implementation of NGSS.

This approach allowed the study to establish these connections because the individual embedded studies exist in the same context but at different locations. The purpose of the study was to understand better the role education leaders play during the implementation of NGSS.

Sample Selection

Merriam (2009) described purposeful sampling as finding participants that will give the most valuable opportunities to gain insight into research questions. Since the current study aimed to discover the connections between support from education leaders and the implementation of the NGSS, the sample contained participants that could assist in establishing this connection. The criterion for the sample of the current study was that each participant must have held either an administrative leadership role or a teaching role within a school that has implemented NGSS. Teachers, school-level leaders, and district-level leaders participated in interviews. The researcher purposely selected district-level leaders to ensure a diverse pool of participants. School-level leaders and teachers were selected based on their willingness to participate in the study.

Participant Descriptions and Pseudonyms

Each participant was presented with a pseudonym to protect his/her anonymity. The researcher excluded any information from the data that could breach a participant's anonymity. Table 1 contains the official pseudonym of each participant, along with a brief description of his/her role within the district.

Table 1

Participant Pseudonyms and Descriptions

Participant Pseudonym	Description
Meredith	Meredith worked as a curriculum coach at a middle school within the district during the implementation of NGSS. She held this role until 1 year before the time of our interview. At the time of the interview, Meredith no longer worked in public education, now working as a curriculum specialist for a private organization.
Stanley	Stanley worked as a science curriculum supervisor within the district during the implementation of NGSS. He no longer holds this position, but still works within the district in a position with more responsibility. Stanley was responsible for the transition of teachers to the NGSS standards.
Pam	Pam worked as a science teacher at a middle school in the district. She was in this position before the implementation of NGSS and at the time of the interview was still working in this position.
Jan	Jan worked as a science teacher at a middle school in the district. She was in this position before the implementation of NGSS. At the time of the interview, she was still working as a teacher at a middle school in the district but on a different middle school campus.
Dwight	Dwight worked as a science teacher and a department chair during the implementation of NGSS. At the time of the interview, he was still working in both of these positions but at a different campus in the same district.
Angela	Angela worked as a science teacher and a department chair during the implementation of NGSS. After the implementation of NGSS, Angela moved into a supervisory role that she still held when the interview occurred.

Excluded information included but is not limited to information about their race, age, school name, and job title. Additionally, the researcher excluded any identifying information about the district from the data.

Data Collection

The current study examined the collection of the following data for research purposes: semi-structured interview, observation, and document analysis. Each subsection below describes how the researcher collected the data and its connection to understand further the research questions presented in the current study.

Semi-Structured Interviews

Interviews are a way to understand how someone interprets his/her environment when the researcher cannot observe the behaviors he/she is seeking to study or if those events have already happened in the past (Merriam, 2009). Specifically, this research used semi-structured interviews in which every participant answered a predetermined set of questions. Still, the researcher had the flexibility to adjust those questions or to follow an unexpected answer with a question that the researcher did not prepare ahead of the interview (Merriam, 2009). The interview questions centered around the implementation of NGSS and participation from different education leadership roles within the school and the district. Ideally, these interviews would have occurred in person, but COVID-19 restrictions within the district necessitated that they occur through Google Meet.

Once the researcher fully developed these interview protocols, the researcher attempted them in a pilot interview with an administrator of a public K-12 high school, an administrator or a public K-12 elementary school, and two elementary science teachers to help establish the proper order of the questions and discover any wording that might be

leading or confusing for the participants. These pilot interviews occurred with individuals that have implemented NGSS, and the researcher discussed the decided order of questions with members of the dissertation committee for the current study. Before these pilot interviews, questions centered around the recommendations from Merriam (2009) and Yin (2018) about how to structure questions to obtain valid data and what to avoid when creating interview questions to prevent unusable data and to reduce the use of words that might lead interviewees to expected answers.

The interview data connected to both RQ1 and RQ2. The interview questions were directly tied to the implementation of NGSS and addressed RQ1 by exploring how the researcher implemented it initially and how it continues to evolve in the classroom. The interview questions also addressed RQ2 since they specifically investigated the roles that administrators took in the implementation of NGSS and how they continue to support further development of NGSS since implementation.

Observation Data

Observation data provided further evidence of how campuses implemented NGSS within the classrooms and how professional development and department meetings developed around this implementation. The researcher would have ideally done these observations in person, but COVID-19 restrictions required that these occurred through digital observation of recorded sessions. As recommended by Yin (2018), observational instruments are needed to assess when specific behaviors occur during specific time periods during a study. The observational tool used for the current study is the NGSS Lesson Screener, which NGSS developed to establish the alignment of a lesson to the goals of NGSS (NGSS, 2013). The researcher was trained by a professional to properly

utilize the NGSS Lesson Screener by performing simultaneous analysis of lesson plans and comparing the instrument usage. Observational data also provide valuable context that enhances the data collected from interviews (Yin, 2018). It is important to note that these observations were not participant observations, as the researcher did not play any notable role within the classroom setting (Yin, 2018).

Additionally, these observations provided field notes and digital photos of the classroom environment, providing a richer context for implementing NGSS within that campus and in specific classroom environments. It was essential to structure the observation to record events as close to incontestable as possible for analytic purposes (Stake, 2010). For clarity, these observations were not of direct classroom instruction but instead of meetings, professional development, and other leadership opportunities as appropriate. Classroom observations only occured when teachers and education leaders state NGSS implementation was stated by the participant as successful or if something mentioned during interviews requires direct observation.

The observation data additionally connected to RQ1 and RQ2. The observations helped examine the level of implementation of NGSS within the classroom, which will address RQ1 directly. RQ1 was further developed by observing the connections or disconnects between teacher perceptions of the implementation of NGSS and the reality of how NGSS functions within those classrooms of participants. RQ2 was addressed more indirectly by observing how education leadership interacted with the teachers during the use of NGSS when they interacted with them in any meaningful way.

Document Analysis

Documents such as lesson plans, handouts, meeting agendas, professional development, and district-level directives provided additional triangulation within the study (Merriam, 2009; Stake, 2010). Examining these documents allowed the researcher to establish the level of implementation of NGSS within the classroom environment and on a district level (Willard, 2014). More importantly, it allowed the researcher to establish any error in perception by participants about the status of implementation in their classrooms and to compare further data from interviews regarding perceived implementation levels and actual implementation levels.

District-level guidelines, professional development agendas, and department meeting notes helped establish what expectations were to happen during the implementation of NGSS. These documents revealed the levels of implementation expected from leadership regardless of what is occurring on a public school campus. The documents came from a diverse set of sources. Merriam (2009) points to the importance of primary sources to establish what intended occurrences within the study, even if the evidence reveals that something else actually happened. It was additionally vital to verify the conditions under which the documents were created and place them in the correct context (Yin, 2018).

When further clarification exists because of the potentially suspicious agreement between teachers and administrators, overly confident statements of implementation examining student work helped establish if those guidelines were appropriately followed (Willard, 2014). Included in the documents were student work samples showing the data collection process of students and the connection of these data to learning practices.

Additionally, the researcher examined formal assessments to establish how the students construct explanations and design solutions and student notes to evaluate how students obtain, evaluate, and communicate information (Willard, 2014). In addition to these student work samples, there were ample samples that do not fit with the expectations of NGSS that the researcher can use to illuminate the level of implementation within a classroom setting. Student documentation helped establish what is happening in the classroom, but documentation further enhanced the case study by examining teacher lesson plans and handouts. These documents helped reveal the implementation level of NGSS before teaching the material occurred. Willard (2014) further points to the importance that planning for a classroom follows the requirements of NGSS to have the standards considered fully implemented. Pre-planning documentation and outcome-driven handouts are essential to establishing implementation within the learning environment (Willard, 2014).

The document analysis directly connected to both RQ1 and RQ2. The most relevant documentation to RQ1 was student work and teacher lesson plans. These documents established the levels of implementation expected by leadership and the level of execution occurring within the classroom, which will address RQ1. RQ2 was handled directly by documentation from both leadership guidelines and meeting agendas and helped establish the level of involvement with school leaders in the proper implementation of NGSS within the classroom.

Data Analysis

The data set for this research study consisted of semi-structured interview notes, direct observation, and documentation from students, educators, and school leadership.

The researcher used data collected from interviews, lesson observation, and documentation to help guide the themes that emerged within the data. Merriam (2009) provided multiple suggestions for establishing data analysis, and the first step was to develop analytic questions that helped the researcher guide the data collection. After the first interviews, the researcher examined the collected data to examine emerging patterns and adjust the questions as needed (Merriam, 2009).

As these data began generating real insights into the research questions, themes were revealed (Merriam, 2009; Stake, 2010). These themes, also known as categories, were relevant to the research, exhaustive, mutually exclusive, sensitizing, and conceptually congruent (Merriam, 2009). The number of categories were unknown but started broad and narrowed down into fewer categories that were more manageable for the researcher. As this process iterated over time, patterns emerged that the researcher then used to understand better the insights revealed from the data.

For RQ1, the data coding helped identify critical connections between concepts that develop as the data are analyzed (Saldana, 2013). In vivo coding was integral to examining RQ1. In vivo coding assists with theme identification by identifying patterns based on an analysis of the data from the participants' perspectives (Saldana, 2013). Additionally, In vivo coding was particularly appropriate for the current study because it is the most appropriate coding for allowing the participant's voice to exist in the manner he/she intended (Saldana, 2013). Saldana also recommended process coding when a researcher is looking for potentially unspoken thoughts or impressions given to the researcher, which became influential in establishing themes in the current study.

RQ2 required the same type of coding to help establish connections between the participants' voices and collected data with the literature about the roles of education leaders in implementing curricula. To help develop these connections, in vivo coding provided a list of codes created from the participants' experiences (Saldana, 2013). Usage of in vivo coding helped develop anticipated categories and actions that assisted with collecting data by focusing on the perception of events from the participants' viewpoint in the study (Saldana, 2013).

Coding the collected data helped identify concepts and establish the connections between those concepts (Saldana, 2013). Saldana further specified that coding is more than giving a label to an idea but connecting it to other data that further links it. There were two stages of coding that occurred in this research: The first cycle, which consists of initial impressions of the data, and the second cycle, which helped the researcher develop more significant categories and themes within the research. The first cycle coding used for this research is in vivo coding, which allows a researcher to take information directly from the participants' experiences and create a set of codes that the researcher can use to generate themes. Saldana also pointed to process coding for identifying key phrases found across interviews. The researcher used this method to establish first cycle coding further. During second cycle coding, the codes generated during the first cycle began to become categorized into broader themes. For the second cycle coding, the researcher used pattern coding because it generally assists with grouping data into more specific pieces in a search for explanations of the data.

As the researcher examined two research questions, the response to each specific question has been coded based on similar responses. This process resulted in emergent

themes that were common among the answers. Since the questions asked during the semi-structured interview explicitly connected to one of the research questions, the researcher could connect conclusions directly to each research question. Interview questions were designed by the researcher with input from Dr. Bryan McCoy and Dr. Lorraine Jacques and piloted by science teachers at two schools not included in the case study. Two interviews were conducted individually and in person. The remaining interviews were conducted separately through Google Meet. The researcher created transcriptions of the interviews using an automated transcription software called Trint, edited for precision by the researcher. The researcher completed the analysis of these interviews.

Analysis

The initial stage for analyzing the data came from the transcription of the interviews. All participants participated in live interviews, which resulted in data that included oral responses. Each of these transcripts was member checked via email, which included all relevant information but excluded data that could potentially identify the participant, any others mentioned by the participant, or information that could identify the school or district in which the participant works.

The next stage of analysis involved examining the interviews by the researcher to begin identifying the initial codes and search for emerging themes. After identifying potential codes, the transcripts were reexamined and formally coded using provisional coding (Saldana, 2013). The initial codes were as follows:

- Transition to NGSS
- NGSS Training
- Teacher Feedback on NGSS

- District Response to Criticism
- Transition to Amplify
- Administration Response to Transition to NGSS
- Coach/Teacher Response to Transition to NGSS
- State Standards Different from NGSS
- How Teachers Received Extra Help
- NGSS Updates

After analyzing these original codes, four themes that relate to the research questions emerged:

- Perception of district training for NGSS
- District's focus on curricula over standards
- Administrator response to teacher concerns
- Fellow educators acting as education leaders

All themes are discussed below with greater detail about how the data supports them.

Trustworthiness

One of the most critical aspects of research is ensuring that the research is trustworthy (Merriam, 2009; Stake, 2010). Three components establish this trustworthiness in qualitative research: internal validity, external validity, and reliability (Merriam, 2009; Yin, 2018). In addition to these three components, they are all tied together with the idea of triangulation, where multiple types of data occurred that help to reinforce and verify other data that the researcher collected to support the emerging themes of the study (Merriam, 2009; Stake, 2010; Yin, 2018).

The internal validity of research focuses on the idea that the investigation must align with what happens in the real world (Merriam, 2009; Stake, 2010; Yin, 2018). This research accomplished this by using data triangulation by overlapping results from interviews, observations, and documentation. The researcher compared survey responses to data gathered from interviews to look for commonality and disagreement in the data. The interview protocols ensured that the data from surveys matched reality and accurately interpreted the provided responses. Additionally, the researcher reinforced the internal validity through member checking, where a researcher reveals potential findings of the study to the participants to gather more feedback on those findings (Merriam, 2009). This case study mirrored this concept by frequently contacting participants and sharing results and interpretations with them.

Shenton (2004) established several criteria that address trustworthiness issues in qualitative research and satisfy the problems of validity and reliability. The internal validity was strengthened by credibility, specifically in this research by triangulation, familiarity with the culture of the school organization, and iterative questioning (Shenton, 2004). Shenton found that triangulation is particularly important because it reduces the researcher's bias. This triangulation was established by comparing interview perspectives from teachers and education leaders with documentation and, when further triangulation was needed, with observable outcomes. Other aspects that address credibility in the current study include but are not limited to peer scrutiny, frequent debriefing, and member checks (Shenton, 2004). The strength of the external validity of the current study results from transferability, which involves clear descriptions of the characteristics of the studied organization and the geographical region where the research was conducted

(Shenton, 2004). Reliability is addressed in the current study through dependability, accomplished through detailed reporting of the processes used and themes that emerged from the research so that future researchers could repeat the work if they so choose (Shenton, 2004).

Researcher Positionality

Every researcher goes into a study with preconceived notions about the studied issues that could potentially guide interpreting findings. Additionally, researchers must be honest about their potential biases that may affect their studies (Yin, 2018). The researcher already had several assumptions about what the research would reveal before the current study. The researcher's current professional position was as a math and robotics teacher in a high school classroom. Currently, the researcher serves as an education leader, which means that the researcher already had several years of experience regarding the connection between education leaders and implementing a curriculum.

Additionally, the researcher served on a state committee examining standards and connecting them to state testing. The researcher was familiar with how standards connect directly to a curriculum and intended to be used within a classroom to guide students correctly. The researcher approached the current study from the perspective of a teacher who has implemented new standards and worked both as an education leader and other education leaders to assist in that implementation.

The researcher combated personal biases in a variety of ways. First, triangulation occurred by combining perspectives from professional development experts, education administrators, and teachers. Additionally, a professional trained in using NGSS tools has trained the researcher to use NGSS screening tools properly. The researcher's coding

protocols established a codebook that includes examples and non-examples of each code. Additionally, an expert not connected to the study reviewed the codebook to ensure that an outside observer could adequately use the codebook. Member checking was also used by sending results to participants to ensure that results were in line with their experiences and perspectives. Finally, the researcher shared the research with researchers who have an opposing view of the study to obtain feedback about the study's findings. Ultimately, the researcher's bias as a teacher is limited because the researcher teaches math and a robotics class that does not use the NGSS. The researcher is also only studying schools within the district where the researcher has never worked and does not have direct connections to those campuses.

Delimitations

The clearest example of a delimitation was upper-level district leadership such as the superintendent and the assistant superintendents. While these district leaders provided support for the implementation of NGSS, their roles were more indirect and tended to be applied equally across all campuses. For example, these leaders will make directives that every campus must follow, but it is implausible that they would directly play a role in following their directions.

District leadership responsible for classifications of schools additionally provided for professional development and finance many of the supports given to implementation, but the duty of actually performing that professional development and deciding which programs offer financial assistance falls to curriculum coordinators whom the researcher included in the study.

Similarly, district leadership responsible for each school classification, such as the middle school supervisor, were excluded from the current study. These district-level leaders also play an indirect role in implementing NGSS and were unlikely to give more support to one campus at the detriment of another campus.

Another group that did not participate in the study were potential education leaders located at schools that have not attempted NGSS. In the district studied, only one alternative school that used an online platform for instruction which did not require lesson plans centered around standards was delimited. This school would have provided little valuable data toward answering the research questions centered around implementing the NGSS as an instructional tool. The data appeared to have reached saturation. Students at this school were moved from one school environment to another. There exists the potential that their results were more reflective of the instruction they received at their home schools than of the education they are currently receiving in an alternative school. Finally, there was the potential to interview more teachers to look for additional themes. The researcher chose to stop pursuing input because it is unlikely that any added teacher and school-level education leaders would have provided further insight into the research questions.

Limitations

Limitations of the current study were outside of the researcher's control, which may have potentially affected the study's findings. The study's primary limitation was that the researcher cannot directly transfer the information obtained to other school districts because of the qualitative nature of the study (Yin, 2018). Additionally, most of the research was focused on events that happened in the past and were not directly

observable by the researcher, so the participants' viewpoints will create limitations. Some of the spaces within schools also had limited access, and some of the school data will not be fully accessible to future researchers because of student confidentiality.

Finally, one of the curriculum coordinators who held the position while the researcher conducted the research was not available to participate in the study. The perspective of this non-participant would have been able to provide a more current view of district-level directives. Another participant partially allowed the researcher to overcome this limitation in the same position within the district during the initial implementation of NGSS. Other relevant participants that worked directly with the non-participant and were able to give their perspectives of the district-level directives that the non-participant could have helped clarify in the study.

CHAPTER 4

RESULTS

The purpose of the current study was to provide a richer context for the methods used by education leaders in the implementation of the NGSS (NGSS, 2013). Two research questions were studied:

RQ1: *What roles have education leaders played in middle schools implementing NGSS?*

RQ2: *What are the teacher perceptions of the role of education leaders in NGSS?*

This chapter will cover a detailed analysis of the research and the data revealed concerning the research questions. Included is an examination of the emergent themes of the study, including a breakdown of supporting data to provide triangulation. Finally, a summary of the themes exists at the end of this chapter.

The researcher answered the two research questions of this qualitative case study by examining data to reveal codes that the researcher organized into themes. The data sources included transcripts from audio recordings of interviews conducted with Google Meet, district-provided lesson plans, and a review of documented professional development to allow the data to triangulate. The researcher used the evidence from this analysis to generate codes, which the researcher then used to create themes. The themes that emerged from the data were perception of

district training for NGSS, focus on curricula over standards, education leader response to teacher concerns, and fellow educators acting as education leaders.

Theme 1: Perception of District Training for Next Generation Science Standards

The similarities between district leadership, school-level content coaches, and teachers regarding district training emerged while examining the data collected from the interview process. These viewpoints helped establish how professional development occurred and the education leaders provided the most leadership and guidance.

Lack of Adequate Training

While examining their experiences with education leaders during the implementation of NGSS, participants had a consensus that the training provided for NGSS was inadequate. Jan stated, “There was no training. We were just told, ‘Don’t use the old textbook. Throw those away.’ Before that, we had a meeting with the curriculum supervisor to talk about what we thought should be at each grade level standard.” Pam commented, “We tried to figure it out. There wasn’t much help at that point, but we did quite well without a book.” Meeting and professional development records from the district show no official NGSS training. Angela supported this theme when she said, “I individually took the initiative to like sign up for webinars. But that was from an outside vendor, not the district.” Meredith recalled, “I don’t know that they were [concerned], except for the OpenSciEd overview training.”

OpenSciEd training addressed NGSS directly but was available only to teachers who volunteered to give up time during the summer to attend. District records show that no official professional development occurred after the initial voluntary introduction to OpenSciEd. Stanley recalled, “The first year where the standards came out, we weren’t

going to throw the standards at them. And the idea was these standards are freaking a lot of people, especially the middle school ones and those who had some other issues because we revamped not only how you taught and what you did with it."

Level of Inadequate Training

While consensus existed on the perceived inadequacy of professional development, there was disagreement among the participants about the district's amount of professional development. Some participants found that the district-level leadership provided no meaningful training at all. When asked when NGSS training took place, Meredith stated that "I don't know that at that point that it ever did." Jan supported this when she said, "We haven't had any training as far as standards go." Other participants recalled some training, but all had a consensus that it was limited and inadequate. Stanley said, "My first professional development with my people was about change. You know, how do you deal with change? What are the stages? Because it's just like grief, you're there in the stages as we move to change." Pam supported that this training happened when they stated, "We did an online training in June before we started teaching it, and I think it might have been four hours." Upon reviewing the district's official training records, it appears that teachers did not receive any NGSS training and that any professional development they did receive focused on curriculum. Additionally, since no official training records indicate that any professional development occurred, some participants recall training was unofficial and was likely not open to all teachers.

State Guided Training

While there was consensus about inadequacy in training by the district, some participants pointed to the poor training starting with the state training. Meredith

remembered that a "group of us went to an OpenSciEd training in [the capital], and then we came back to train the science teachers." Angela also participated in this training, recalling that "I was one of the trainers who came back and led the charge. We had several days of really intense, condensed training. We tried to do it justice because our training at the state was a week-long, and we didn't have much time once we came back." Dwight also participated in the state training and said, "It was very difficult to give to the teachers because we were still breaking it down because we just spent a whole week with it. It's a lot of work." The district provided these newly-trained trainers only 3 hours to work with teachers during the summer before NGSS implementation. Since this training does not appear on the official record, it was not available to all teachers within the district but only to the trainers directly invited.

Summary

There exists a consensus among the participants that the district had inadequate training for the transition to NGSS. Every participant came to this conclusion. There was disagreement on how ineffective the training was, ranging from the belief that the district provided no training to providing up to 6 hours of training. Finally, a few participants knew that the state-provided training separate from the district's level. These participants were all in consensus that it was too brief to have made a significant difference in their perception of the adequacy of the district-level training.

Theme 2: District's Focus Since Implementation of Next Generation Science Standards

The similarities between district leadership, school-level content coaches, and teachers regarding the district's focus emerged while examining the data collected from

the interview process. These viewpoints helped establish how the teaching of NGSS is affected by the district and what the identified education leaders do in reaction to the district's focus.

The Search for a Curriculum

While examining their experiences with district leadership during the implementation of NGSS, participants had a consensus that the district's immediate response to the implementation of NGSS was to find a curriculum, known as OpenSciEd, that addressed the new standards. Meredith said, "I think they really tried hard to find a curriculum that we could use that we could afford, and it was OpenSciEd because it was free." Angela also agreed that the district started using OpenSciEd because "OpenSciEd was free." Pam recalled that "we did some kind of mess called OpenSciEd. [OpenSciEd] was the biggest mess ever because it wasn't even complete." Jan also mentioned that "OpenSciEd at the time wasn't complete." OpenSciEd (2021) confirmed this, as OpenSciEd had reported that they had not yet created a complete curriculum at the time of this research. Stanley pointed out that this led to a search for an alternative curriculum because "[the district] started focusing on Tier 1 [Curriculum]. If it's not Tier 1, you can't put it in [a lesson plan]." Stanley further pointed out that "funding from the state was tied to using [a] Tier 1 [Curriculum]."

Curricula Over Standards

While examining their experiences with district leadership during the implementation of NGSS, participants had consensus within their groups as teachers or supervisors that the district's focus became a focus of a curriculum over covering the standards. The participant that represented the district was unable to support this theme

but also did not refute the theme. Pam recalled that "the [district] decides we're going to go to Amplify. It is Tier 1." Dwight said, "[The district] first projected Amplify to us as this is OpenSciEd but Tier 1." Dwight expanded upon this when he recalled that "[the district] doesn't want us to understand the standards, they want us to teach Amplify." Angela stated, "[Amplify] claim[s] to be aligned to [state] standards. And, of course, they're not. They add a few lines in a paragraph somewhere and say this meets the standards." The official professional development resource for the district supports these claims since there had been no official training for using the science standards. Still, there were 11 training sessions between 2018 and 2020 to implement Amplify.

Teacher Frustration

While examining their experiences with district leadership during the implementation of NGSS, all participants agreed that the district's focus on a curriculum created frustration among teachers. Stanley predicted frustration before implementing Amplify when he recalled that "California had been working for 5 years, and they still didn't have these things implemented yet. So we were saying, now you have to start teaching this." Pam said she was frustrated when "Amplify comes back with this book, and I'm not kidding. It has articles in it to meet the standards, and the standard may be met in one little paragraph of a whole article." Support for this exists in district documentation about Amplify, which frequently references specific standards inclusion because it appears in additional supplementary reading to the curriculum. Pam further lamented, "I'm not teaching, [I] open up a PowerPoint, and read from it."

Jan stated that the frustration she saw stemmed from "Amplify is just approaching the standards differently than the assessment guides them. So [students] are tested one

way, and Amplify [is] teaching it another." Jan also said, "I just want to know that I'm doing something that will prepare them because we taught Amplify with fidelity last year. They bombed that test." Dwight showed agreement when he said, "We can't go back and teach that standard because that's not what Amplify wants us to do." Support centered around these stated frustrations exists from the state department of education, which has documented that the initial rating of Amplify was as Tier 2 and then added supplementary material to get rated Tier 1 a year later (DOE, 2021).

Summary

There is a consensus among the participants that the district initially sought a solution to use the standards as intended but eventually began to focus on a Tier 1 curriculum over teaching the standards. Nearly every participant came to this conclusion, and the one participant who did not come to this conclusion did not refute the finding. Additionally, all participants were aware that this shift of focus created concern among teachers that they were not teaching the standards as intended to be used.

Theme 3: Response to Teacher Concerns

Similarities between district leadership, school-level content coaches, and teachers regarding the responses to teacher concerns emerged while examining the data collected from the interview process. These viewpoints helped establish how the teaching of NGSS is affected by teacher perceptions and what the identified education leaders do in reaction to the concerns brought forth by teachers.

District Response

There is a consensus among the participants that the district developed an adversarial relationship with teachers after teacher concerns emerged. Pam said,

"[Teachers] don't give feedback because you are told that this is what they bought. They spent a lot of money on it. This is what you're teaching." When straying from the Amplify curriculum, Pam said, "I got in trouble for it. Trouble because you're not supposed to add stuff in, not supposed to do this, not supposed to do that." Jan supported this when she said, "We were all really afraid that if we didn't do it, we would get in trouble." Dwight also provided support when he said, "We brought these concerns to those that are higher up, and it got to the point where we were getting threatened with our jobs because [they said] this is what we paid money for." Support for this stated fear of reprisal from the district exists with the teachers' lesson plans, which do not deviate from the Amplify lessons provided by the district.

Two participants revealed secondary lesson plans that they do not share with the district. While discussing his secret lesson plans, Dwight said, "Whenever we have that downtime trying to hit those standards, but we have to do it secretly because if the word gets out that we are teaching our students, not [using Amplify with] our students, we get [in trouble]." Jan also mentioned secret lesson plans that she feels are necessary because "I get stressed out that if something I feel like doesn't teach the standard the way that it says it, suppose it's going to be tested, right?" Jan did clarify that she had stopped trying to secretly teach the standards when she stated, "I also know that the expectation is to follow Amplify. I'm going to do what I'm told." Pam supported this when she talked about no longer trying to make lesson plans. She said, "[I] just stand up and read the script and get a paycheck at this point."

School-level Administrator Response

There exists a consensus among the participants that school-level administrators were sympathetic to teacher concerns but felt powerless to address those concerns. Meredith mentioned that school administrators were afraid to push back against the district because "they would get in trouble or there'd be an issue." Pam said, "My principal would turn me loose, and it's hard. He would turn all of us loose because he knows we know the content." Dwight further supported this when he said, "Our principal will defend us, but at the same time, he's getting his butt chewed out, and he stops that and just tells us to just do this." Dwight further expanded on this when he said, "[Administration is] going to back us up and make sure that the students are learning what they need to know. However, their hands are tied by the poor leadership coming from above them." Stanley was the only participant that did not match the group's consensus. He stated, "In the end, it boils down to your campus administration; your principal is your instructional leader. What we did as a district is from the curriculum side is we would do walk-throughs." However, another statement by Stanley seems to show some consensus with the rest of the participants when he said, "If I see someone expanding what they're supposed to do, I can then go talk to them, I can talk to them directly, or I would go document it."

There also existed consensus that school-level administrators were willing to assist when they were able. Angela said, "They made a really strong effort to be present and listening, and they were trying to understand the difference. If we approached with a need for materials, they tried to compromise, which was appreciated." Jan also stated, "Sometimes [administration] was [helpful]. [Administration] can do an Amazon order

and get it or try to do something different if you can. It just depended on, I guess, what, where we were in the year." Dwight added, "Luckily, we have science people as our [administrators] doing our formal observations." Angela further stated, "As far as content knowledge, you know, [the principal] could be a little bit of a help but implementation? No, not as helpful."

Summary

There is a consensus among the participants that there is an adversarial relationship between district leadership and other district members, specifically teachers. Additionally, there exists agreement that school-level leaders provided support with positive intentions but felt powerless to overrule the district about curriculum decisions.

Theme 4: Fellow Educators Acting as Education Leaders

Similarities between district leadership, school-level content coaches, and teachers regarding the education leaders that provided insight and assistance for the implementation of NGSS emerged while examining the data collected from the interview process. These viewpoints helped establish who the education leaders were in the district as it transitioned to NGSS and the identified education leaders to assist in this transition to NGSS.

On-Campus Education Leaders

There is a consensus among the participants that essential education leaders existed on their campuses that helped during the transition to NGSS. Meredith discussed her role when she stated, "We would set a goal for the week and then go into classrooms and [write] a summary of what we saw, what needed to improve, and how we were going to work with the teacher to improve." While discussing the initial transition to NGSS,

Pam said, “There was a lot of creativity. We did interactive notebook stuff. We would use that old book to make notes pages.” Dwight stated, “A lot of times that’s when I’m talking with other teachers, when I’m talking to my team.” Angela also said a lot of her understanding came from “communicating with other teachers.” Jan stated, “[Campus teachers are] good about sharing with each other.” Stanley, off-handed referencing teachers, said, “They were really supportive of themselves.”

Off-Campus, In-District Education Leaders

There is consensus among the participants that essential education leaders existed in the district but not on their campuses that helped during the transition to NGSS. Stanley supported this viewpoint when he stated that “the schools have pretty good staff so they can get help.” Meredith, discussing education leaders from the district, said, “They had a shared Google Drive. [Teachers] could access things that they had written in Google Drive.” Researchers can find the support of these local education leaders in the middle school science Google Drive, which is accessible to all middle school science teachers within the district.

Pam also supported this by saying, “[Our curriculum coach] is very supportive. She’s there for the teachers, and I can tell.” Jan said, “When we were doing OpenSciEd, we used [the Google Drive] a lot. But since we started Amplify, there’s not a lot being added.” Dwight added, “Our curriculum coach or instructional coach could walk in and [provide help] from what she understands [about] the Amplify curriculum.” Angela also stated, “[Curriculum resources] were shared out by the district from our coordinator.”

Off-Campus, Out-of-District Education Leaders

There is a consensus among the participants that essential education leaders outside the district helped during the transition to NGSS. Stanley supported this when he said, “You could get online and type in [help for NGSS], and you could find out what somebody did in California.” While discussing education leaders, Pam said, “I’ve even gone to other teachers, Google Classrooms like at other schools, just to see what’s on their website.” Angela added that she would use “Twitter groups, so they [came] from anywhere, and then I did also have contact information from teachers within the state who had gone to the same OpenSciEd training. But mostly if I had big, big questions, I would just kind of put them out into the universe, right?” Dwight also reluctantly acknowledged that “Amplify did provide video recordings of other teachers teaching the material.”

Summary

There is a consensus among the participants that there are education leaders on-campus or off-campus, but in the district, and off-campus and out-of-district. The consensus also points to the two most important groups to the participants: the on-campus education leaders and the education leaders that can be found off-campus and out-of-district.

CHAPTER 5

DISCUSSION

The study aims to generate thick descriptions that will lead to a richer perspective of the roles that education leaders play in implementing NGSS. This qualitative case study centers around the following research questions: 1) What roles have education leaders played in middle schools implementing NGSS, and 2) What are the teacher perceptions of the role of education leaders in NGSS? Six participants were interviewed through Google Meet to address these research questions. These interviews were recorded, transcribed, and analyzed for emerging themes. The researcher triangulated the data from these interviews with training materials from the district, observations of recorded lessons, and lesson plans provided by participants. Chapter 5 serves as a summary of the conclusions of this qualitative case study. Chapter 5 describes themes and places these themes within the context of existing research. Additionally, it contains recommendations for practice based upon the findings, the implication of these findings for further study, and a conclusion.

Discussion of Emergent Themes

Perception of District Training for Next Generation Science Standards

The first significant finding is the perception that a lack of training for implementing the NGSS impacts the roles played by education leaders. This finding

directly addresses the roles education leaders played in middle schools in the implementation of NGSS (RQ1) and teacher perceptions of the roles of education leaders in NGSS (RQ2). Science teachers need to feel that the district will provide sufficient training to implement an entirely new shift in standards as occurs with NGSS to establish vital education leader roles and help develop tools for the development of students into scientists. This need aligns with the idea that education leaders need to understand the research behind NGSS, provide an equitable learning environment for students, provide adequate professional learning opportunities, and be change leaders (Stiles et al., 2017). Additionally, this aligns with the idea that school-level leaders must engage education leaders in training that focuses upon theories of which all other leaders within the school will have a functional understanding (Parkes, 2013).

Education research also finds that standards function best when educators receive proper professional development on correctly using them (Lauer et al., 2005). Another finding is that middle school teachers received between 0 and 6 hours of training on how to use NGSS and that this perception of inadequate training led to discomfort with the shift in focus upon the implementation of NGSS. Many of the negative perceptions of NGSS expressed in the present study can be directly linked to the inadequate training provided by the district.

Another finding of the present study is that the most valuable training for NGSS came directly from the state department of education or OpenSciEd. This finding somewhat conflicts with existing research that found professional development for NGSS should originate from colleagues and not from outside sources (Lotan et al., 2019). However, the positive comments about the external training could have resulted from the

district's lack of professional development. The research would support the findings of Lotan et al. had that local professional development occurred in a meaningful way.

District's Focus Since Implementation of Next Generation Science Standards

The second significant finding is that the district shifted its focus from implementing the NGSS to finding a curriculum that purported to cover all the standards presented by NGSS. With the emphasis on curriculum over standards, the district leadership shifted away from the intended focus of NGSS to create a generation of new scientist-students. The implications of this finding are important for understanding the context of the roles education leaders played in the implementation of NGSS (RQ1) and especially important for understanding teacher perceptions of education leaders in NGSS (RQ2).

The present study found that the district put forth a good-faith effort into finding a curriculum that adequately addressed the requirements of NGSS. Current research supports the importance of this initial effort, which finds that influential education leaders must focus on the type of curriculum, the likely reaction to the curriculum, and the desired outcomes of using a curriculum (Glatthorn et al., 2019). Education leaders identified in the present study were believed to be looking for a helpful curriculum for teachers but initially decided on an incomplete curriculum that puts a lot of pressure on teachers to develop practical lessons while simultaneously learning the new standards themselves. Current research warns against this when it identifies the most critical consideration for a new curriculum is the time and ability to establish expertise before presenting the material to students and understanding the connection between the standards as presented and how the state department of education will test them on the

standardized test (Glatthorn et al., 2019). Additionally, current research finds that education leaders must establish expertise because no individual education leader possesses complete knowledge of any topic (DeMatthews, 2014).

The present study additionally found that the district eventually focused on finding a Tier 1 Curriculum instead of concentrating on NGSS and the goals of those standards. Current research finds that national standards such as NGSS are an attempt to mold education to fit the needs of students better as demanded by society, in this case, to help create students that will develop into scientists (Hamilton et al., 2008). The importance of focusing on standards over curriculum is further addressed by current research because standards-based reform has historically resulted in steady and occasionally significant increases in student retention of information (Hauser et al., 2007; Penfield, 2010). The current research does not address any potential disconnects between a Tier 1 Curriculum and the standards they should cover effectively.

The present study also found that the shift of the district from standards to curriculum created a considerable sense of frustration among education leaders, especially those still acting as classroom teachers. Current research finds that one of the keys to successfully implementing NGSS is to examine people, policies, processes, and practices to ensure that education leaders and the teachers they oversee can all maintain fidelity (Stiles et al., 2017). Additionally, current research points to the importance of education leaders being carefully cultivated and given the freedom to develop alignment to the standards (Lotan et al., 2019). The district in the present study has created the perception that the standards are not the driving force behind the decision-making process.

Administrator Response to Teacher Concerns

The third significant finding is that the response to teacher frustrations has led to an adversarial relationship between district-level education leadership and education leaders at every other level. As a result of this negative relationship, many school-level administrators acting as education leaders must find a balance between appeasing district-level education leadership and addressing teachers' concerns as they work within the required curriculum. Additionally, the present study finds that some teachers in the district have become so frustrated by the adversarial relationship that they have surrendered direct control of their classrooms to avoid potential conflicts between themselves and administrators. The implications of this finding are vital to understanding the perceptions of education leaders in NGSS (RQ2).

These findings show the district acting in direct conflict with current research. The district in the presented study appears to be not working in the best interests of the students but instead in the best interests of political objectives (Hoy & Tarter, 2008). The district's purpose seems to be rooted in funding from the state department of education, which is tied directly to using a Tier 1 Curriculum with fidelity to have access to additional funding. Current research finds that education leaders that focus on personal objectives instead tend to result in inefficient workplaces and unhappy employees (Uhl-Bien & Marion, 2008). The presented research supports this idea with repeated statements by participants regarding threats to their jobs and seeing many of their coworkers leave education to avoid the adversarial environment.

Additionally, the presented research shows that school-level education leaders struggle to find the balance between addressing the concerns of teachers on their

campuses and the demands of education leaders at the district-level. Current research shows that these education leaders are following the least bad path provided to them by providing as much freedom for leaders to focus on theory (Parkes, 2013). By attempting to act as education leaders, despite doing it secretly, current research shows the schools will become more aligned with implementation goals (Schwartz & Ticknor, 2017). Additionally, teachers will have a greater degree of confidence in their abilities (Schwartz & Ticknor, 2017). Current research does not address the implications on teachers working in conditions where the goals of the campus are aligned with the district in theory but are oppositional in reality.

Fellow Educators Acting as Education Leaders

The fourth significant finding is that education leaders can appear in many roles. These roles are incredibly diverse, including on-campus and off-campus professionals within the district and off-campus and working outside the district. The most important of these identified education leaders are those working outside the district because they appear to play a vital role in helping teachers understand their roles in implementing NGSS and moving forward when they run into problems with the standards. The implications of this finding are integral to understanding both what roles education leaders played in middle schools in the implementation of NGSS (RQ1) and teacher perceptions of the roles of education leaders in NGSS (RQ2).

The present study found that on-campus education leaders played vital roles in implementing NGSS. Current studies support the importance of education leaders on campus to help set the direction, organize teachers and staff, and align curricula to the standards (DeMatthews, 2014). Education leaders help others understand their roles in

developing their responsibilities to act as leaders of smaller groups to support the school leadership in achieving its implementation goals (Schwartz & Ticknor, 2017). Additionally, the present study finds that these education leaders located on campus are not strictly school administrators but include curriculum coaches and other teachers. Current research supports that principals play a significant role as education leaders but that teachers play a much more substantial role in developing organizational goals and are vital to creating institutional changes (York-Barr & Duke, 2004).

The present study also found that education leaders who work at other campuses were helpful. These education leaders were vital because they presented expertise that was often unavailable on an individual campus and allowed teachers to expand their knowledge bases. Still, teachers accessed some of the most valuable education leaders through online resources such as Twitter and Facebook. Current research supports the importance of these off-campus education leaders because they help others understand how they can achieve campus and district goals (Stiles et al., 2017). Additionally, these education leaders act to inspire others to move toward the goals of their schools (Harrison & Birky, 2011). Current research also finds that connecting teachers and their varied experiences help connect teachers with the purposes of the curriculum (Goddard et al., 2010). Finally, these education leaders are essential because teachers with high pedagogical knowledge of their contents help build confidence in potential future education leaders (Sherman & MacDonald, 2008).

Recommendations

This qualitative case study explored the experiences of teachers and administrators with a focus on identifying valuable education leaders and helping understand how the district implemented NGSS. Recommendations for potential education leaders and districts preparing to implement new standards exist below.

Focus on Standards Not Curriculum

Participants shared experiences in which education leaders adjusted their focus toward curriculum instead of standards. The position of the participants did not appear to influence the perception of this shift by education leaders. To properly implement a set of national standards, specifically NGSS, all levels of a district need to have the same set of goals. Since the results of a standardized test measure teacher effectiveness, teacher focus will naturally be on the standards. Any school district's leadership should reevaluate its priorities to focus on the skills needed to turn students into future scientists. If a school district's leadership cannot adjust to this because of the connection between the curriculum and state funds, that leadership must include teachers in the decision-making process in a meaningful way. A school district's leadership could use a Distributed Leadership Model to help better understand the feelings of that district's teachers and help reduce potential morale issues that have emerged as a result of focusing on the curriculum instead of the standards.

Addressing an Adversarial Relationship Between a District and Teachers

Participant experiences indicate that district-level education leaders have created an adversarial environment between its district-level education leaders and the teachers tasked with teaching middle school science. All but one participant referenced instances

in which district-level leaders threatened teachers' jobs for voicing their concerns about the Tier 1 Curriculum selected by education leaders. These actions have created a situation in which teachers pretend to teach one way, hiding their actual lessons out of fear of reprisal. These threats to teachers create two significant problems for a school district: 1) Teachers do not trust that district-level education leaders have their best interests at heart, and 2) A school district's leadership does not know what is truly happening in the classroom and, therefore, cannot effectively manage teacher shortcomings.

It is vital that a school district's leadership that has operated in a manner perceived by its teachers as adversarial immediately restructure how it addresses teacher concerns. Due to the perception that a school district's leadership might be indifferent to teacher concerns and actively antagonistic, the school district's leadership should consider forming a committee of education leaders that includes teachers and administrators to examine teacher concerns for validity. While this committee does not necessarily have to exist permanently, it should function until the restoration of trust in education leaders from the district that the district leaders are genuinely concerned with the needs of those education leaders within the classroom. Any concerns brought by this committee should then have the district leadership's response examined by the committee to determine if it adequately addressed those teacher concerns.

Professional Development

Participants shared experiences in which they felt undertrained and underprepared for the implementation of NGSS. The position of the participants did not appear to influence the perception of inadequate training, but there were disagreements about the

level of inadequacy. Participants also shared the belief that most education leaders did not have specific knowledge of the expectations of NGSS. To properly implement a new set of standards, specifically NGSS, every level of education leader must enter the year of implementation fully trained on what implementation requires. Additionally, a school district needs to emphasize creating more student scientists to fulfill their roles as change agents within society.

Ideally, this professional development for all levels of education leaders should have occurred before implementing NGSS. Suppose it is too late for this recommendation. In that case, a school district's leadership could start training its education leaders on the proper use of NGSS and adapting the chosen curriculum to fit the standards. Decision-makers should train district-level education leaders to identify the critical factors for success with NGSS and communicate effectively how those factors tie to the goals of a school district. Furthermore, campus-level education leaders need the training to establish what NGSS looks like in a classroom and help teachers develop lesson plans that effectively implement the three domains of NGSS.

Trust Teachers

Finally, participants universally felt that district-level education leaders did not trust their abilities to manage the new standards presented with NGSS. These statements were most overt among participants closer to the classroom and subtler among participants in district-level leadership. Still, every participant expressed concern that teacher expertise was an untapped resource. A school district's leadership needs to evaluate its stance on teachers and move toward a leadership model that incorporates more trust in teachers' motivations to produce successful student scientists. This

suggestion is not to lower expectations but rather to allow teachers to have some autonomy in their classroom functions and create a more alighted model with distributed leadership.

Implications for Future Research

This qualitative case study's finding provided insight into education leadership roles during the implementation of NGSS within one school district in the rural South. Next, the findings provided insight into teacher perceptions of education leadership within the same school district during the implementation of NGSS. Other questions emerged that have implications for future research. As a result of this qualitative case study, an adversarial relationship between the district and campus-level education leaders emerged. Although there exists research on different leadership styles from district-level education leaders, further research is needed to examine how districts have created restorative practices to regain trust with teachers while maintaining the fidelity of a national standards shift. Secondly, the participants perceived that the district focused on curriculum over standards. Further research comparing the attitudes and perceptions of teachers in a district focused on curriculum over standards to the attitudes and perceptions of teachers in a district focused on standards over curriculum would enhance the understanding of the role the approaches have in the effective implementation of NGSS.

Conclusion

The study aimed to generate thick descriptions that will lead to a richer perspective of the roles that education leaders play in implementing NGSS. The results of

this qualitative case study contributed to a clearer understanding of the role education leaders play in the implementation of NGSS while also adding to the research gap on the role of administrators during the implementation of NGSS (Stiles et al., 2017). Addressing this gap in knowledge could provide additional insight into potential pitfalls of district-level education leaders during implementation.

The researcher studied a small sample of participants in the implementation of NGSS in one school district in the rural South to investigate the role of education leaders. The findings demonstrated the differences between the recommended process for implementation of NGSS (Stiles et al., 2017) and the actual process used in the district. These findings indicate a perception of distrust between district-level education leaders and campus-level education leaders. The development of a curriculum plays an essential role in implementing national standards (Glatthorn et al., 2019), including NGSS. As a result, it is necessary to explore the successes and failures of districts that have implemented NGSS.

This qualitative case study resulted in the emergence of other research paths. First, because the district appears to have an adversarial relationship with its teachers, further research is needed to explore how other district's leaders have restored healthy relationships between members of leadership and teachers after creating a perception of negativity. Additionally, further research may be necessary to compare results from a district such as the one studied with a district focused on the standards instead of the curriculum.

In conclusion, the most important finding of this qualitative case study was the perception that the district leadership became more focused on a specific curriculum

instead of seeking to create better student scientists. As the gap between society's need for more scientists and the number of students becoming scientists continues expanding, it is clear that school district's leadership must place more emphasis on science education and act as change agents to fill that societal need. The researcher's perception was that participants would assist in identifying education leaders and understanding their roles as education leaders. The participants ultimately realized that they were participating in deception against the perceived threats from the district to better serve their students' needs as future scientists.

REFERENCES

Allen, C. D., & Penuel, W. R. (2014). Studying teachers' sense making to investigate teachers' responses to professional development focused on new standards. *Journal of Teacher Education*, *66*(2), 136–149. https://doi.org/10.1177/0022487114560646

American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 14005, 6, Stat. 115. (2009).

Barton, P. (2009). *National education standards: Getting beneath the surface.* Educational Testing Service.

Boudett, K. P., City, E. A., & Murnane, R. J. (2015). *Data wise: A step-by-step guide to using assessment results to improve teaching and learning*. Harvard Education Press.

Brass, J. (2014). Reading standards as curriculum: The curricular and cultural politics of the common core. *Journal of Curriculum and Pedagogy*, *11*(1), 23–25. https://doi.org/10.1080/15505170.2014.907551

Brownell, M. T., Ross, D. D., Colón, E. P., & McCallum, C. L. (2005). Critical features of special education teacher preparation. *The Journal of Special Education*, *38*(4), 242–252. https://doi.org/10.1177/00224669050380040601

Bush, S. B., & Cook, K. L. (2019). *Step into steam grades k-5: Your standards-based action plan for deepening mathematics and science learning*. Corwin.

Camphuijsen, M. K., & Levatino, A. (2021). Schools in the media: Framing national standardized testing in the Norwegian press, 2004–2018. *Discourse: Studies in the Cultural Politics of Education*, 1-6. https://doi.org/10.1080/01596306.2021.1882390

Cochran-Smith, M., Piazza, P., & Power, C. (2013). The politics of accountability: Assessing teacher education in the United States. *The Educational Forum*, *77*(1), 6–27. https://doi.org/10.1080/00131725.2013.739015

Covey, S. R., Covey, S., Summers, M., & Hatch, D. K. (2014). *The leader in me: How schools around the world are inspiring greatness, one child at a time*. Simon & Schuster.

Del Blanco, A., Serrano, A., Freire, M., Martinez-Ortiz, I., & Fernandez-Manjon, B. (2013). E-learning standards and learning analytics: Can data collection be improved by using standard data models? *2013 IEEE Global Engineering Education Conference (EDUCON)*. https://doi.org/10.1109/educon.2013.6530268

DeMatthews, D. E. (2014). How to improve curriculum leadership: Integrating leadership theory and management strategies. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, *87*(5), 192–196. doi:10.1080/00098655.2014.911141

DeMink-Carthew, J., Olofson, M. W., Legeros, L., Netcoh, S., & Hennessey, S. (2017). An analysis of approaches to goal setting in middle grades personalized learning environments. *Research in Middle Level Education Online, 40*(10), 1–11.

Dunkle, C. A. (2012). *Leading the common core state standards: From common sense to common practice*. Corwin.

Elmesky, R. (2012). Building capacity in understanding foundational biology concepts: A k-12 learning progression in genetics informed by research on children's thinking and learning. *Research in Science Education, 43*(3), 1155–1175. https://doi.org/10.1007/s11165-012-9286-1

Epler-Brooks, P. (2019). *Cases on service delivery in special education programs*. IGI Global.

Glatthorn, A. A., Boschee, F., Whitehead, B. M., & Boschee, B. F. (2019). *Curriculum leadership: Strategies for development and implementation*. Sage Publications.

Goddard, Y. L., Miller, R., Larsen, R., Goddard, R., Madsen, J., & Schroeder, P. (2010, May 3). *Connecting principal leadership, teacher collaboration, and student achievement* [Conference presentation]. Annual Meeting of the American Education Research Association, Denver, CO, United States.

Goodman, J. (2012). *Gold standards: State standards reform and student achievement* (HKS Working Paper No. RWP12-031). Harvard Kennedy School.

Grant, A., & Hartley, M. (2013). Developing the leader as coach: Insights, strategies and tips for embedding coaching skills in the workplace. *Coaching: An International Journal of Theory, Research and Practice, 6*(2), 102–115. https://doi.org/10.1080/17521882.2013.824015

Gregory, G. H., & Kuzmich, L. (2014). *Data driven differentiation in the standards-based classroom*. Corwin.

Hamilton, L. S., Stecher, B. M., & Yuan, K. (2008). *Standards-based reform in the United States: History, research, and future directions*. Center on Education Policy.

Harrison, S., & Birky, G. (2011). Revisiting Teacher Leadership: Perceptions of Teachers and Principals. *Northwest Journal of Teacher Education, 9*(2). doi:10.15760/nwjte.2011.9.2.3

Hauser, R. M., Frederick, C. B., & Andrew, M. (2007). *Grade retention in the age of standards-based reform* (CDE Working Paper No. 2007–04). Center for Demography and Ecology.

Hilty, E. B. (2019). *Thinking about Schools: A foundations of education reader*. Routledge.

Hout, M., & Elliott, S. (2011). *Incentives and test-based accountability in education*. National Research Council.

Hoy, W. K., & Tarter, C. J. (2008). *Administrators solving the problems of practice decision-making concepts, cases, and consequences*. Pearson.

Hudson, T. (2012). *Routledge handbook of language testing*. Routledge.

Jorgenson, M. A., & Hoffman, J. (2003). *History of the No Child Left Behind Act of 2001 (NCLB)*. Pearson.

Kantabutra, S. (2005). Improving public school performance through vision-based leadership. *Asia Pacific Education Review, 6*(2), 124–136. https://doi.org/10.1007/bf03026780

Khoza, S. B. (2016). Is teaching without understanding curriculum visions and goals a high risk? *South African Journal of Higher Education*, *30*(5). https://doi.org/10.20853/30-5-595

Kralovec, E., & Buell, J. (2005). High-stakes testing, homework, and gaming the system. *Humanist, 65*(3), 17-18.

Kurland, H., Peretz, H., & Hertz-Lazarowitz, R. (2010). Leadership style and organizational learning: The mediate effect of school vision. *Journal of Educational Administration*, *48*(1), 7–30. doi:10.1108/09578231011015395

Lauer, P. A., Snow, D., Martin-Glenn, M. L., Buhler, R. J., Stoutemyer, K. L., & Snow-Renner, R. (2005). *The influence of standards on K-12 teaching and student learning: A research synthesis*. McRel.

Leithwood, K. A., Mascall, B., & Strauss, T. (2009). *Distributed leadership according to the evidence*. Routledge.

Leko, M. M., Brownell, M. T., Sindelar, P. T., & Kiely, M. T. (2015). Envisioning the future of special education personnel preparation in a standards-based era. *Exceptional Children*, *82*(1), 25–43. https://doi.org/10.1177/0014402915598782

Lenz, B., Wells, J., & Kingston, S. (2015). *Transforming schools Using project-based Learning, performance assessment*. John Wiley & Sons.

Levine, T. H., & Marcus, A. S. (2007). Closing the achievement gap through teacher collaboration: Facilitating multiple trajectories of teacher learning. *Journal of Advanced Academics*, *19*(1), 116–138. https://doi.org/10.4219/jaa-2007-707

Loeb, H., Knapp, M. S., & Elfers, A. M. (2008). Teachers' response to standards-based reform: Probing reform assumptions in Washington state. *Education Policy Analysis Archives, 16,* 9. https://doi.org/10.14507/epaa.v16n9.2008

Lotan, R. A., Burns, D., & Darling-Hammond, L. (2019). *The Instructional Leadership Corps: Entrusting professional learning in the hands of the profession*. Learning Policy Institute.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. Jossey-Bass.

Millar, R. (2006). Twenty first century science: Insights from the design and implementation of a scientific literacy approach in school science. *International Journal of Science Education*, *28*(13), 1499–1521. https://doi.org/10.1080/09500690600718344

Moore, T. J., Glancy, A. W., Tank, K. M., Kersten, J. A., Smith, K. A., & Stohlmann, M. S. (2014). A framework for quality K-12 engineering education: Research and development. *Journal of Pre-College Engineering Education Research (J-PEER)*, *4*(1), Article 2.

NCLB (No Child Left Behind) Act of 2001, Pub. L. No. 107-110, § 101, Stat. 1425 (2001).

NGSS. (2013). *Next Generation Science Standards: For states, by state*s. The National Academies Press.

Noddings, N. (2005). Identifying and responding to needs in education. *Cambridge Journal of Education*, *35*(2), 147–159. https://doi.org/10.1080/03057640500146757

Nolet, V., & McLaughlin, M. J. (2005). *Accessing the general curriculum: Including students with disabilities in standards-based reform*. Corwin Press.

Offit, P., Handy, L., & Bodenstab, H. (2014, November 5). *Autism*. Children's Hospital of Philadelphia. https://www.chop.edu/centers-programs/vaccine-education-center/vaccines-and-other-conditions/vaccines-autism.

Parkes, R. J. (2013). Challenges for curriculum leadership in contemporary teacher education. *Australian Journal of Teacher Education, 38*(7), 112-128. doi:10.14221/ajte.2013v38n7.8

Penfield, R. D. (2010). Test-based grade retention. *Educational Researcher, 39*(2), 110–119. https://doi.org/10.3102/0013189x10363007

Penuel, W. R., & Gallagher, L. P. (2009). Preparing teachers to design instruction for deep understanding in middle school earth science. *Journal of the Learning Sciences*, *18*(4), 461–508. https://doi.org/10.1080/10508400903191904

Preedy, M., Bennett, N., & Wise, C. (2012). *Educational leadership: Context, strategy and collaboration*. Sage Publications.

Rogers, K., & Spring, B. (2020). '*We are outnumbered' - cybersecurity pros face a huge staffing shortage as attacks surge during the pandemic*. MSN. https://www.msn.com/en-us/money/

Saldana, J. (2013). *The coding manual for qualitative researchers*. Sage Publications.

Samancioglu, M., Baglibel, M., & Erwin, B. J. (2019). Effects of distributed leadership on teachers' job satisfaction, organizational commitment and organizational citizenship. *Pedagogical Research*, *5*(2). doi:10.29333/pr/6439

Scheufele, D., & Krause, N. (2019, April 16). *Science audiences, misinformation, and fake news*. Proceedings of the National Academy of Sciences of the United States of America. https://www.pnas.org/content/116/16/7662.

Schmidt-Davis, G., & Bottoms, J. (2010, August). *Three essentials: Improving schools requires district vision, district and state supports and principal leadership*. Southern Regional Education Board.

Schwartz, C., & Ticknor, A. S. (2017). Beginning elementary mathematics teachers negotiating leadership responsibilities. *Journal of Interdisciplinary Teacher Leadership, 1*(2), 3–18. doi:10.46767/kfp.2016-0006

Sheehan, J. A. (2011). *Responding to student needs: The impact on classroom practice of teacher perceptions of differentiated instruction* (Publication No. 3489941) [Doctoral dissertation, Capella University]. ProQuest Dissertations Publishing.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information, 22*(2), 63–75. doi:10.3233/efi-2004-22201

Shepard, L., Hannaway, J., & Baker, E. (2009). *Standards, assessments, and accountability* [White paper]. National Academy of Education.

Sherman, A., & MacDonald, L. (2008). Instructional leadership in elementary school science. *International Electronic Journal for Leadership in Learning, 12*(12), 12.

Smith, J., & Thier, M. (2017). Challenges to common core state standards implementation: Views from six states. *National Association of Secondary School Principals Bulletin, 101*(3), 169–187. https://doi.org/10.1177/0192636517712450

Smith, T. N. (2013). *Teachers' perceptions of the efficacy of standards-based IEP goals* (Publication No. 3571445) [Doctoral Dissertation, University of New Orleans]. ProQuest Dissertations Publishing.

Spillane, J. P. (2006). *Distributed leadership*. Jossey-Bass.

Stake, R. E. (2010). *The art of case study research*. Sage Publications.

Stecher, B. M., & Naftel, S. (2006). *Implementing standards-based accountability: Study design, state context, and accountability policies*. RAND Corporation. http://www.rand.org/pubs/working_papers/2006/RAND_WR380.pdf

Stern, B. S. (2007). *Curriculum and teaching dialogue.* Information Age Pub.

Stiles, K., Mundry, S., & DiRanna, K. (2017). *Framework for leading next generation science standards implementation*. WestEd.

Strauss, V. (2015, March 10). No Child Left Behind: What standardized test scores reveal about its legacy. *Washington Post*. https://www.washingtonpost.com/news/answer-sheet/wp/2015/03/10/no-child-left- behind-what-standardized-test-scores-reveal-about-its-legacy/.

Tomlinson, C. A. (2016). *The differentiated classroom: Responding to the needs of all learners*. Pearson Education, Inc.

Uhl-Bien, M., & Marion, R. (2008). *Complexity leadership*. Information Age Pub.

Vlachopoulos, D. (2016). Assuring quality in e-learning course design: The roadmap. *The International Review of Research in Open and Distributed Learning*, *17*(6), 184-198. doi:10.19173/irrodl.v17i6.2784

von Glaserfeld, E. (1998). Cognition, construction of knowledge, and teaching. *Constructivism in Science Education*, 80(1), 11–30. http://files.eric.ed.gov/fulltext/ED294754.pdf

Wall, H., Balani, A., & Larkin, D. (2021, January 14). *What psychology can tell us about why some people don't wear masks – and how to change their minds*. The Conversation. https://theconversation.com/what-psychology-can-tell-us-about-why-some-people-dont-wear-masks-and-how-to-change-their-minds-150343.

Wanker, W. P., & Christie, K. (2005). State implementation of the no child left behind act. *Peabody Journal of Education, 80*(2), 57–72. https://doi.org/10.1207/s15327930pje8002_4

Willard, T. (Ed.). (2014). *The NSTA quick-reference guides to the NGSS K–12*. NSTA Press.

Williams, T., Kirst, M., & Haertel, E. H. (2005). *Similar students, different results: Why do some schools do better? A large-scale survey of California elementary schools serving low-income students*. EdSource.

Winn, K. M. (2016). *Instructional leadership in elementary science: How are school leaders positioned to lead in a next generation science standards era?* (Publication No. 10143199) [Doctoral Dissertation, University of Iowa]. ProQuest Dissertations Publishing.

Wolchover, N. (2017, May 30). *Are flat-earthers being serious?* LiveScience. https://www.livescience.com/24310-flat-earth-belief.html.

Yin, R. K. (2018). *Case study research and applications: Design and methods*. Sage.

York-Barr, J., & Duke, K. (2004). What do we know about teacher leadership? Findings from two decades of scholarship. *Review of Educational Research, 74*(3), 255–316.

APPENDIX A

HUMAN USE APPROVAL LETTER

LOUISIANA TECH
UNIVERSITY

OFFICE OF SPONSORED PROJECTS

EXEMPTION MEMORANDUM

TO: Mr. Billy Neill and Dr. Bryan McCoy

FROM: Dr. Richard Kordal, Director of Intellectual Properties
rkordal@latech.edu

SUBJECT: HUMAN USE COMMITTEE REVIEW

DATE: November 4, 2021

TITLE: **"A Case Study of the Perceptions of Education Leaders on the Implementation of the Next Generation Science Standards"**

NUMBER: HUC 22-025

According to the Code of Federal Regulations Title 45 Part 46, your research protocol is determined to be exempt from full review under the following exemption category(s): 46.104 (a)(d)(1)(2)(i)(ii).

a) Unless otherwise required by law or by department or agency heads, research activities in which the only involvement of human subjects will be in one or more of the categories in paragraph (d) of this section are exempt from the requirements of this policy, except that such activities must comply with the requirements of this section and as specified in each category.

(d) Except as described in paragraph (a) of this section, the following categories of human subjects research are exempt from this policy:

(1) Research, conducted in established or commonly accepted educational settings, that specifically involves normal educational practices that are not likely to adversely impact students' opportunity to learn required educational content or the assessment of educators who provide instruction. This includes most research on regular and special education instructional strategies, and research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

(2) Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met:

(i) The information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects;

(ii) Any disclosure of the human subjects' responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, educational advancement, or reputation

Thank you for submitting your Human Use Proposal to Louisiana Tech's Institutional Review Board.

APPENDIX B

INITIAL E-MAIL REQUESTING PARTICIPATION

Good Morning,

I am reaching out to you in hopes that you would be willing to participate in a study I am conducting to develop my dissertation for Louisiana Tech in pursuit of my doctorate. Your inside knowledge of how training is conducted for Science in [your district] is vital for creating a better understanding of how your campus implements the Science Standards.

What I Would Need from You

I just need 30 minutes of your time to ask you a set of questions through Zoom or Google Meets. I can work around your schedule to make sure it is as convenient as possible.

Why Should You Do It?

While I am conducting this study for Louisiana Tech, my qualitative study seeks to get a clearer view of potential strengths and weaknesses within the systems currently in place. The more Science teachers willing to participate in the study, the clearer that picture will be. This is a unique opportunity to have your voice heard in a completely confidential environment.

Is It Really Confidential?

Yes. I am the only person that knows who agrees to participate. For the purposes of the study, all participant names will be anonymized so that nobody else can identify them. Additionally, any specific names mentioned by participants will also be anonymized to prevent contextual clues that would lead back to the identities of participants. If you would like more information about how this is done, please ask me for more details and I will be happy to share IRB standards and regulations with you.

What Next?

Just respond to this e-mail that you are available and I will reach to finalize details with you. If you would prefer not to add your voice to the study, please let me know so that I can remove you from my list of potential participants.

Thank you for your time and I look forward to talking to you.

Billy Neill

APPENDIX C

EXAMPLES AND NON-EXAMPLES OF CODES

The examples and non-examples of codes.

Code	Example	Non-Example
Transition to NGSS	So the first year of implementation, we were using OpenSciEd and it was this beautiful curriculum that was so student centered.	This year I've been to three Amplify trainings that were almost all exactly the same that probably accumulated 12 hours overall. But since they're all exactly the same, it just counts for four, you know, three four hour sessions.
NGSS Training	So I was one of the fortunate few who got to go to the statewide training we'd chosen to use a curriculum developed by a group called OpenSciEd. And so I got to go to that training, so I was trained by the curriculum developers themselves.	When we went to NGSS. And, man, the first couple of years, I can remember thinking, what in the world are we even supposed to be teaching? How do we even make any sense out of this stuff?
Teacher Feedback on NGSS	I think NGSS has hit everybody kind of hard, especially the people with a science background and that have been teaching science a long time.	I got chewed out for not having a written lesson plan for only having a digit like handwritten. I had a digital lesson plan and she wanted handwritten.
District Response to Criticism	You will not teach more than a lesson a day. What if somebody in the parish goes to another school and they all need to be on the same page when they go?	Give the teacher some input. Let them. We're not stupid, you know, especially the teachers that have been doing this for a long time.
Transition to Amplify	When we moved from OpenSciEd to Amplify, there was a training at a Middle School, where some eighth grade teachers were chosen to pilot.	I use the evidence statements from NGSS. Because they're attached to each standard. And I found those like as soon as we switched to the new standard, so I've just always looked to see.
Administration Response to	Our principal will defend us, but at the same time, he's	I got in trouble for it. Trouble from [the supervisor] because

Code	Example	Non-Example
Transition to NGSS	getting his butt chewed out and he stops kind of doing that just tells us guys, just do this.	you're not supposed to add stuff in, not supposed to do, this is not supposed to do that.
Coach/Teacher Response to Transition to NGSS	They had walkthrough tools, and really that was their job of the instructional coach and the coach would have to do. We were expected to do, I guess, weekly walk through and that we would report back if we saw anything of concern. We would, of course, give that feedback to the teacher.	My principal would turn me loose, and it's hard. He would turn all of us loose because he knows we know the content.
State Standards Difference From NGSS	NGSS standards the whole nation uses are not the same as in NGSS [state specific] standards. Right? They rearrange them and deleted about 15 of them. To make them [state] standards.	It's all been connected for us. They tell us last year that's that was the point I wanted to make.
How Teachers Received Extra Help	I think is not everything was covered at the beginning in OpenSciEd, so teachers were just trying to find stuff. I'll say a lot of them use Teachers Pay Teachers and we just try and find something for that standard.	A lot of times if I've already passed the standard, I'll either save it for the year or just save it for next year. I feel like I'm doing the kids a disservice because of that.
NGSS Updates	I get the emails from the state every time they update the standards	It was mostly again like a Facebook group for each unit.