

2020

Teacher Perceptions of Alternative Grading to Support Authentic Learning

Gina Nicole Sese
Walden University

Follow this and additional works at: <https://scholarworks.waldenu.edu/dissertations>

 Part of the [Science and Mathematics Education Commons](#)

This Dissertation is brought to you for free and open access by the Walden Dissertations and Doctoral Studies Collection at ScholarWorks. It has been accepted for inclusion in Walden Dissertations and Doctoral Studies by an authorized administrator of ScholarWorks. For more information, please contact ScholarWorks@waldenu.edu.

Walden University

College of Education

This is to certify that the doctoral dissertation by

Gina Sese

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee

Dr. Gladys Arome, Committee Chairperson, Education Faculty

Dr. Cheri Toledo, Committee Member, Education Faculty

Dr. Alice Eichholz, University Reviewer, Education Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2020

Abstract

Teacher Perceptions of Alternative Grading to Support Authentic Learning

by

Gina Sese

MPhil, Walden University, 2020

MA, Concordia University, 2016

BS, Nova Southeastern University, 2010

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Education

Walden University

August 2020

Abstract

Alternative grading practices are often used in authentic learning environments where the focus is on connecting instruction to real-world issues, problems, and applications. Scholarly literature lacks research studies related to teacher perceptions of alternative grading to support authentic learning. The purpose of this basic qualitative study was to explore the perceptions of high school science teachers regarding their use of alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. The conceptual framework for this study was based on Herrington and Oliver's instructional design framework for authentic learning environments. The focus of the research questions was on how high school science teachers perceive their implementation of alternative grading as a support for authentic learning, student reflection, and student articulation of their learning. Data were collected from 11 high school science teachers using qualitative interviews. Participants were selected through the purposeful sampling method. The data collected were then coded by hand and using qualitative data analysis software to discover emergent themes. Findings indicated that educators perceived their use of alternative grading, student self-reflection, and articulation opportunities to be essential for supporting student learning in an authentic learning environment. This study may contribute to best practices in education by providing school district administrators with information they can use to develop professional development for new teachers that is focused on alternative assessment strategies. With this knowledge, educators may be more empowered to provide education that prepares students for real-world challenges.

Teacher Perceptions of Alternative Grading to Support Authentic Learning

by

Gina Sese

MPhil, Walden University, 2020

MA, Concordia University, 2016

BS, Nova Southeastern University, 2010

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Education

Walden University

August 2020

Dedication

This study is dedicated to my husband, Alex, and to my two children, Lily and Sofia. I am so lucky you are mine. Thank you for understanding the struggles associated with obtaining this degree and thank you for all the sacrifices you made. Thank you for supporting me and laughing while you went through fun times without me (your giggles always brightened my day). Thank you for the times where you listened to me sing while writing in the office and thank you for dealing with my endless worries and insecurities while I stressed my way through the writing of this dissertation. Alex, you are my best friend and confidant, you are my everything. You push me to be the best version of myself, and you brag about me to everyone who will listen. I love you; thank you for being my rock throughout this journey.

Sofia, Lily, you are my everything. Everything good I have is given to you so that you make this world better without effort. I love you both so much, my angels, my daughters, my everything.

To my mother and father, Christina and Joseph Mirto, thank you for believing in me, for listening to me cry, and encouraging me when this journey was tough. Thank you for teaching me how to be a good student, daughter, mother, and wife. Because of the two of you, I am the person I am today. You deserve recognition for that.

Without all of you, I could never have done it. You all are my shining lights, you are my future, and you are my life. I hope I made you proud. I love you.

Acknowledgements

First, I would like to thank my dissertation committee: Dr. Gladys Arome, my dissertation chair and methodologist; Dr. Cheri Toledo, my second member content expert for the study; and Dr. Alice Eichholz, my URR. John Maxwell said “One of the greatest values of mentors is the ability to see ahead what others cannot see and to help them navigate a course to their destination.” That is what you did for me. Thank you for helping me through this process. All of you were so kind, understanding, and firm. You made sure I would finish and see this through to the end. Your guidance and patience were unwavering, and I appreciate all that you did to help me succeed.

Second, I thank my partner in crime, Whitley Webb. Without your support as my dissertation partner, I would not have done it. You kept me pushing through when I was at my worst, and you were my sounding board when I needed to rework ideas. Thank you for sharing in my frustrations and successes. We started and finished together; we did it!

Table of Contents

List of Tables	v
Chapter 1: Introduction to the Study.....	1
Background of the Study	5
Problem Statement	8
Purpose of the Study	10
Research Questions.....	10
Conceptual Framework.....	11
Nature of the Study.....	12
Definitions.....	13
Assumptions.....	13
Scope and Delimitations	14
Limitations	15
Significance.....	16
Summary.....	17
Chapter 2: Literature Review.....	19
Literature Search Strategy.....	22
Conceptual Framework.....	23
Literature Review Related to Key Concepts.....	28
A History of Grading Practices.....	28
Alternative Grading	30
Authentic Learning	38

Self-Reflection	43
Articulation of Learning	51
Summary and Conclusions	57
Chapter 3: Research Method.....	60
Research Design and Rationale	60
Research Design and Tradition.....	61
Consideration for Other Designs	62
Role of the Researcher	63
Methodology.....	64
Participant Selection Logic.....	64
Instrumentation	66
Procedures for Recruitment, Participation, and Data Collection.....	68
Data Analysis Plan.....	70
Issues of Trustworthiness.....	71
Ethical Procedures	74
Summary.....	75
Chapter 4: Results.....	76
Setting	76
Demographics	77
Data Collection	80
Data Analysis	81
Evidence of Trustworthiness.....	86

Credibility	86
Transferability.....	87
Dependability	88
Confirmability.....	88
Results	89
Research Question	89
Subquestion 1	107
Subquestion 2.....	114
Discrepant Cases.....	126
Summary	128
Chapter 5: Discussion, Conclusions, and Recommendations.....	131
Interpretation of the Findings.....	131
Alternative Grading	132
Alternative Grading Through the Removal of Grades.....	136
Authentic Learning	137
Alternative Grading and Authentic Learning	138
Self-Reflection	140
Articulation of Learning	141
Summary of the Interpretation.....	143
Limitations of the Study.....	143
Recommendations.....	145
Implications.....	146

Conclusion	148
References.....	151
Appendix: Interview Protocol.....	174

List of Tables

Table 1. Participant Demographics.....78

Table 2. Emergent Themes From Research Questions.....83

Chapter 1: Introduction to the Study

Alternative grading is a term used in education to describe grading methods and assessment methods that are different from traditional summative assessment (Percell, 2017). In the United States, only a handful of educational institutions have embraced alternative grading in its most basic form, an authentic learning environment free from the traditional 4-point scale or A, B, C, D, F marking scheme. Authentic learning environments are classroom settings that mimic real-world situations (Horning et al., 2019) and provide hands-on learning and drive curiosity (Gundogan & Gultekin, 2018). They are the heart of inquiry-based instruction that involves critical thinking (Irwanto, Saputro, Rohaeti, & Prodjosantoso, 2019). In these settings, educators often employ alternative assessments, which are any assessments outside traditional formative assessment (Horning et al., 2019; Percell, 2017). Alternative assessments can take the form of feedback, discussion, observation, and self- and peer reflection, among others (Percell, 2017).

This reluctance to switch may exist because few researchers have investigated the many facets of this complex nongrading system. Although several researchers (Kaya, 2018; Keinänen, Ursin, & Nissinen, 2018; Kinay, 2018; Luo, Murray, & Crompton, 2017; Pearce, 2016; Schmidt-Jones, 2017) have examined authentic learning environments and alternative assessments, they have not considered the effects of alternative assessments on student outcomes, student learning, and student articulation of knowledge or the impact of self-reflection on student understanding. An example of an investigation that does not entirely explore alternative grading settings but does touch on

alternative assessment comes from Barber, King, and Buchanan (2015). Their investigation involved examining problem-based learning, which is considered an alternative assessment in an online setting. Barber et al.'s findings indicated that instructors initially resist the change to problem-based learning because "they have to examine how relevant their grading practices are, and step outside of what are often institutional or systemic methods of grading students" (p. 63). This statement explains teachers' reluctance to change grading methods, but it does not address the topic of alternative grading outside the administration of alternative assessment. In studying problem-based learning, Barber et al. thus touched on the phenomenon of alternative assessment but did not examine it comprehensively.

Similarly, Chiu, Pu, Kao, Chih-Chien, Wu, and Huang (2018) investigated alternative grading without addressing the grading system itself; they examined an evaluation method for authentic learning environments. The results indicated that students become more aware of the importance of the different aspects of their learning when alternative grading is used (Chiu et al., 2018). But the results did not target the specific learning outcomes associated with self-reflection (the alternative grading measure used), nor did the results demonstrate whether or not the self-reflection was a way to replace a letter or number grade. Chiu et al. (2018) evaluated the grading methods but did not investigate or report on the employed nongrading technique.

In recent research and debate focusing on alternative grading, many stakeholders have argued that students are ill prepared for the workforce due to the commonality of high-stakes testing (Winasih, Cahyono, & Prayogo, 2019). Stakeholders have expressed

discontent with the testing culture present in the United States, calling for reform (Hawley & Whitman, 2020). The educational community's response has been to investigate the depth of authentic learning environments and their effects on student outcomes.

For example, Cetinkaya (2018) used teacher perceptions to explore the development of an attitude scale toward authentic learning environments and evaluation in a science education setting. Cetinkaya (2018) stressed the importance of learning scientific content. He noted that the most fundamentally sound environment to develop scientific thinking while reaching curricular goals is through the use of authentic learning environments (p. 195). Again, this study addresses an authentic learning environment that might employ alternative grading methods, but it does not directly address alternative grading.

Two concepts intertwined with alternative grading and authentic learning are self-reflection and articulation. Various researchers have cited one item or the other as support for either using an alternative assessment or creating an authentic learning environment. For example, Pai, Ko, Eng, and Yen (2017) focused on performance learning among nursing students. Their findings focused on reflective practices. Pai et al. stated that self-reflection in nursing education improved learning effectiveness and competency and reduced anxiety. Additionally, Abdullah, Hussin, and Ismail (2019) conducted a mixed-methods study to investigate the effect of a flipped-classroom approach (authentic learning) on student learning outcomes. They found that not only were students comfortable presenting information and articulating their knowledge but that the flipped

classroom and articulation practices in this class made other classes less satisfying and effective (Abdullah et al., 2019).

Under the scope of alternative grading, various researchers have highlighted authentic learning and alternative assessment. Still, they have not addressed the removal of a grading system or teacher perceptions of using these grading methods. Existing research also fails to address student outcomes related to self-reflection or the articulation of knowledge based on the removal of traditional grading methods. Therefore, this study is important to the educational community because it may provide insight on a vastly unexplored topic.

This study may impact positive social change by providing knowledge for teachers struggling to differentiate between traditional and nongrading techniques in their classrooms. An overall lack of problem-solving and critical thinking skills among today's student population is a current global crisis (Basri, Purwanto, As'ari, & Sisworo, 2019; Harjo, Kartowagiran, & Mahmudi, 2019; Schmidt-Jones, 2017). These skills are essential for members of society to grow and prosper. Critical thinking and problem-solving skills are the foundation for success in necessary disciplines, such as medicine, education, technology, and engineering (Nauman, 2017). Without addressing the root of the problem and determining ways to rectify the issue, these skills will continue to remain a mystery to most students (Nauman, 2017). The results of this study may provide information on settings that encourage students to use, develop, and apply critical thinking and problem-solving skills. In addition, resources and findings from this study may help educators to gauge various learning styles. Results may also help educators understand student

displays of knowledge in the classroom, through articulation or reflection opportunities. Using study findings, educators may be better able to plan for and develop authentic learning environments using alternative grading techniques.

Chapter 1 includes the background, problem statement, and purpose of this study, the focus of which was on the implementation of instructional design to create alternative grading methods in support of authentic learning. I also provide the research questions and conceptual framework for the study. Then, I describe the reasoning behind the methodology, followed by critical definitions for the study and key concepts relevant to the research. Next, I discuss the assumptions, scope and delimitations, and limitations of the study. The chapter concludes with an overview of the significance of the research study and its potential to contribute to positive social change.

Background of the Study

As prior researchers have indicated, the trend in U.S. education, since 2008, has been the emphasis of standards-based education with norm and criterion-referenced assessments being the standard measure of academic fluency (Brewer & deMarrais, 2015; Brookhart et al., 2016; Fairman et al., 2018; Kinay & Ardic, 2017; Link, 2018; Myers, 2018, 2019). Although there has been a shift in education away from authentic learning and critical thinking toward a more test-driven system (Barnes & Slate, 2013; Scogin et al., 2017), some advocates have called for a renewed emphasis on authentic learning. Various researchers who have studied authentic learning describe the inability of students to perform in the real-world/workforce setting (Bowen & Peterson, 2019; Winasih et al., 2019; Wyatt & Nunn, 2019). Apart from educational studies focusing on this functional

decline, corporations have noticed a decrease in the caliber of real-world-ready students entering the global workforce; real-world-ready students are defined as graduates from university who are equipped and prepared to navigate and succeed in the fields they enter (Minocha, Hristov, & Leahy-Harland, 2018). As a result, both educators and workforce administrators have pushed for the improvement of learning environments, fostering active learning, with an emphasis on alternative grading has made a resurgence (Bdiwi et al., 2019; Scogin et al., 2017). In any given country, this call for reform is often referred to as the *employability agenda*.

The employability agenda—an initiative enacted in England but practiced in many countries—was designed and enacted by business leaders and educators to produce graduates who had acquired the necessary core skills to secure employment and flourish in the environment in which they were employed (Lee, Foster, & Snaith, 2016; Mawson & Haworth, 2018; Moore & Morton, 2017). The core abilities often referenced are problem-solving and critical thinking skills (Schmidt-Jones, 2017). Despite these recent calls for reform, graduates are still entering the workforce ill prepared. Waves of unprepared students being produced indicate a shortcoming in practice and in the understanding of how to prepare the students for the realities of the workforce properly. A review of the literature demonstrates that authentic learning environments are best suited to produce the types of graduates that the U.S. workforce and country want to see. As researchers (CITE) studying the topic have noted, educators in authentic learning environments employ alternative assessments.

Brookhart et al. (2016) addressed the significance of grades in the classroom via a meta-analysis of grading practices over the past 100 years. They found that classroom grading practices are multidimensional and that classroom grading practices reflect classroom achievements, predict cognitive and noncognitive abilities, and predict future success better than standardized/high stakes testing (Brookhart et al., 2016). Brookhart et al.'s research provides insight into the importance of indicators (grades or assessments) in the educational setting; grades have become indicators of success, and they are viewed by some as giving students, teachers, parents, and communities essential information about the learning environment (Brookhart et al., 2016). However, what is missing in this meta-analysis is the success rates of students who take part in educational settings free of grades. Nongrading is still a grading practice, but it is absent in literature spanning 100 years of practice.

Gozyuesil and Tanriseven (2017) also conducted a meta-analysis, but their focus was on the effect of alternative assessment techniques on student learning outcomes. Their findings show that keeping a portfolio seemed to yield the highest success rate, with students indicating that their level of understanding and satisfaction with their learning was significantly higher based on the utilization of alternative assessment techniques. Again, this study, like many others before it, highlights the success rates of students who are provided alternative assessments. However, the authors failed to indicate if the portfolio was graded and if the evaluation was categorized as traditional or alternative.

For teachers, alternative assessment encompasses creating and administering assessments outside of the realm of the traditional norm-referenced exam (Myers, 2018). For students, alternative assessment refers to the ability to examine their work, reflect on their thinking process, and articulate strengths and deficiencies in their knowledge base (Pearce, 2016; Shafeek, Viswambaran, & Baby, 2019). For this study, alternative grading methods go beyond what the literature defines them as. The literature often refers to rubrics, discussions, observations, etc. as alternative assessment or grading (Bektas, 2019). In the studies mentioned above, the topics of grades, grading practices, authentic learning, and alternative assessment have been investigated. However, no study addresses alternative grading methods, as defined earlier, as support for authentic learning. This study will build on current literature regarding the use of alternative grading methods. It will also provide new information on the use of alternative grading methods as a support for authentic learning, student self-reflection, and student articulation of knowledge.

Problem Statement

The problem addressed by this qualitative interview study was the lack of knowledge regarding high school science teachers' perceptions of using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. As Nauman (2017) observed, the current U.S. student population lacks critical thinking and problem-solving skills. The cornerstones of alternative grading (also referred to as alternative assessment in the literature) are student self-reflection and student articulation of knowledge. In an authentic learning environment, learners construct meaning and apply their knowledge to the solution of a problem within the

context of a real-life situation or personal experience (Keinänen et al., 2018). Research has shown that grading in the K-12 setting has become test-driven, and real-life practice in authentic learning environments has been pushed aside (Ydessen & Andreasen, 2019). It is unclear how high school science teachers perceive using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning (Ydessen & Andreasen, 2019).

Graduates of this test-driven approach entering the workforce many times lack problem-solving and critical thinking skills (Schmidt-Jones, 2017). This assertion illustrates the importance of exploring high school science teachers' use of alternative grading to support authentic learning, student self-reflection, and student articulation of their learning that will enable students to apply their knowledge to the workplace (Cetinkaya, 2018). Although the literature provides information about the use of student self-reflection and students' articulation of their learning in authentic learning settings (Thibodeaux et al., 2019), there was still a need to explore high school science teachers' perceptions of the use of alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. Percell (2017) provided evidence regarding the influence that authentic learning environments and alternative grading have on building student skills and the transference of those skills to the real world. In his previous work, he also acknowledged that there was a gap in the literature regarding the perceptions of high school science educators who use alternative grading approaches to support authentic learning (Percell, 2014). I conducted this study to address this gap in the literature.

Purpose of the Study

The purpose of this qualitative interview study was to explore the perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. Educational research has established that alternative grading methods in authentic learning environments provide a setting for student academic success (Bektas, 2019; Ott et al., 2018; Zwahlen, 2018). However, little was known about the perceptions and experiences of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. Using interviews, I explored high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning. The results of this study contribute to existing literature focusing on instructional design to provide clear and organized strategies for designing alternative grading methods and implementing them in authentic learning environments.

Research Questions

To explore high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning, I developed the following research question and subquestions:

Research Question (RQ): How do high school science teachers perceive their implementation of alternative grading as a support for authentic learning?

Subquestion 1 (SQ1): What are the perceptions of high school science teachers regarding how alternative grading supports student self-reflection?

Subquestion 2 (SQ2): What are the perceptions of high school science teachers regarding how alternative grading supports student articulation of their learning?

Conceptual Framework

I based the conceptual framework for this study on the instructional design framework for authentic learning environments (IDFALE) by Herrington and Oliver (2000). Herrington and Oliver developed the IDFALE framework “to identify the critical aspects of situated learning to enable it to translate into teaching methods that could be applied in the classroom” (p. 3). The framework consists of the following nine constructs:

- provide authentic contexts that reflect the way the knowledge will be used in real life (Construct 1),
- provide authentic activities (Construct 2),
- provide access to expert performances and the modeling of processes (Construct 3),
- provide multiple roles and perspectives (Construct 4),
- support collaborative construction of knowledge (Construct 5),
- promote reflection to enable abstractions to be formed (Construct 6),
- promote articulation to enable tacit knowledge to be made explicit (Construct 7),
- provide coaching and scaffolding by the teacher at critical times (Construct 8), and
- provide for authentic assessment of learning within the tasks (Construct 9); (Herrington & Oliver, 2000).

I used the first, sixth, and seventh constructs as a foundation for my exploration of high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning. The constructs also provided a foundation for the development of the interview questions and a framework for the data analysis.

Nature of the Study

The nature of this study was a general qualitative approach, using interviews as the source of data to explore the perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning (Merriam & Tisdell, 2016; Patton, 2015; Yin, 2016). Qualitative research provides a textural description of the experience of individuals in a given study or setting, which makes the research productive and explanatory in nature (Mack, Woodsong, MacQueen, Guest, & Namey, 2005; Shenton, 2004). Yin (2014) supported this claim by stating that qualitative questions that attempt to explain the “how” or the “why” create a descriptive study, which considers operational links to events through meaningful experiences. Through interviews, the researcher can then begin to link these events and relate the information acquired to create a picture or an idea that is supported by data (Patton, 2015; Yin, 2016).

The focus of this study was to explore high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning. As the data collection tool, to address the focus of the

study, I conducted interviews with 11 participants, coded data collected, and synthesized themes that emerged from the data to describe results and report conclusions.

Definitions

Alternative grading: Methods of evaluation beyond the letter-grade system, such as essay responses, oral presentations, reflection, portfolios of compiled work, and practical demonstrations of gained knowledge (Gozuyesil & Tanriseven, 2017; Kosteklioglu & Celen, 2016).

Articulation of learning: The act of expressing in coherent verbal form and creating rich conversational artifacts for discussion and presentation (Herrington & Oliver, 2000; Pea, 1991).

Authentic assessment: An assessment strategy that asks a student to apply real-life learning, which is often used in authentic learning environments, to gauge whether or not the student can apply learned concepts (Kinay, 2018).

Authentic learning: A wide variety of educational and instructional techniques focused on connecting what students are taught in school to real-world issues, problems, and applications (Cetinkaya, 2018).

Self-reflection: A deliberate action used to evaluate personal thinking, which also assists in the improvement of the thought process and outcomes (Herrington & Oliver, 2000; Herrington et al., 2014).

Assumptions

I based the study on several assumptions. Due to the nature of science and its ability to provide concepts and contexts in a real-world setting, I assumed that the science

classroom, where authentic grading is occurring, would be the best environment to observe authentic learning (see Gundogan & Gultekin, 2018). I also assumed that all participants would be honest and share their own authentic experiences (see Patton, 2015; Yin, 2016). Qualitative interviews provide rich, expressive, and accurate investigations into a human experience, according to Patton (2015). As such, I assumed that interviews would be effective in terms of obtaining authentic data. Furthermore, I assumed that coding would be a suitable means to discover themes in data. As Yin (2016) noted, coding is an accepted and practiced qualitative data analysis techniques. Last, I assumed that I would be able to monitor and address personal bias in this qualitative study (see Rubin & Rubin, 2012).

Scope and Delimitations

The problem addressed by this qualitative interview study was the lack of knowledge regarding high school science teachers' perceptions of using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. To fill the gap in the literature focused on the lack of information surrounding the use of nongrading techniques in authentic learning environments, I developed three research questions that would target data from nongrading techniques in authentic learning environments. Through purposeful sampling methods, 11 high school science teachers volunteered to participate in this qualitative research study. The criteria for participant selection included the following: they must be a high school science teacher, they report that they use alternative grading methods, and they create authentic learning environments in their classrooms. While analyzing the results of the study,

Herrington and Oliver's (2000) IDFALE was used as a framework to guide understanding and rationale for the derived information from the data. Although the IDFALE has its foundation in constructivism theory, the IDFALE's is more specific to learning environments present in science teachers' classrooms. Therefore, the use of IDFALE was more applicable to the study. Additionally, although the focus of this study was a population of science teachers, the design of the study is transparent and transferrable and can be applied to various educational subjects.

Limitations

A potential challenge for the study was the possibility of a limited population of science teachers that fit the requirement of the study. This limitation did not prove to be a challenge in participation recruitment as I was able to access participants via principals at nontraditional or magnet schools.

A potential challenge for all qualitative research lies within the methodology itself. In qualitative research, the sample size interviewed may not be a statistically significant population size to report appropriate findings applicable to an entire occupation (Price & Murnan, 2004). Another limitation in qualitative research is the nature of the interviews. When interviewing, the research is receiving a narrative or response that cannot be confirmed. The researcher is relying on the lived experience of another individual without verification (Price & Murnan, 2004). As I will not be observing the participants, I can only relay their experiences and perceptions without having observational data to support the findings.

One final limitation of this study relates to the literature published on the subject of alternative grading and alternative assessment. Peer-reviewed literature has very little data published on the complete removal of a traditional marking scheme (percentage grades, 4.0 scale grades, or pass/fail grades). Alternative grading is a broad term to reflect alternative assessments, alternative grading techniques, and alternatives to traditional assessments (discussions, observations, etc.). These limitations were considered throughout the study and reported thoroughly in Chapter 5.

Significance

My study was expected to fill a gap in the literature by exploring the perceptions of high school science teachers regarding their use of alternative grading to support authentic learning to prepare their students to solve problems related to real-life experiences through self-reflection and articulation of their education. Educational practices, such as the promotion of self-reflection and articulation of knowledge, may help to improve student learning. The results of this study may contribute to best practices in education by providing other teachers with the tools to enhance student learning and develop critical thinking skills. The potential to improve educational practices may give the power to educators to provide education that prepares students for real-world challenges. Because teacher perceptions “give their actions a sense of direction” (Priestly, Biesta, & Robinson, 2015, p.38), insights gained from this study could help inform educators as to the usefulness of alternative grading to support authentic learning for the purpose of developing problem-solving and critical thinking skills that students can transfer to the workplace.

Summary

The problem that will be addressed by this qualitative interview study is the lack of knowledge regarding high school science teachers' perceptions of alternative grading to support authentic learning, which is rooted in the knowledge that the current student population lacks critical thinking and problem-solving skills (Nauman, 2017). To address that problem, I opened this chapter with a brief overview of the subject and content of the dissertation. I focused on the lack of information in the educational community regarding high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning. However, little is known about the experiences and perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. The foundational concepts and conceptual framework related to this gap will be discussed further in Chapter 2.

After describing the background information related to alternative grading methods utilized in authentic learning environments, I explained the purpose and research questions for this study. Then, I introduced the conceptual framework for the study, which focused on Herrington and Oliver's (2000) Instructional Design Framework for Authentic Learning Environments (IDFALE). Next, I described the nature of this qualitative interview study, which was followed by essential definitions, assumptions, scope and delimitations, and limitations. Finally, in the significance of this study portion of the chapter, I discussed educational practices and positive social change. In Chapter 2, I will discuss Herrington and Oliver's (2000) Instructional Design Framework for

Authentic Learning Environments (IDFALE) and the alternative grading methods research literature in detail. I will describe the research literature on five topics: the history of grading practices, alternative grading, authentic learning, self-reflection, and articulation. Chapter 2 will provide the basis for this exploratory study concerning existing research literature.

Chapter 2: Literature Review

The cornerstones of alternative grading (also referred to as alternative assessment in the literature) are student self-reflection and student articulation of acquired knowledge. In an authentic learning setting or environment, learners construct meaning and apply their knowledge to the solution of a problem within the context of a real-life situation or personal experience (Keinänen et al., 2018). Research has shown that grading in the K-12 setting in the United States has become test-driven and that real-life practice in authentic learning environments has been pushed aside (Barnes & Slate, 2013; Scogin et al., 2017; Ydessen & Andreasen, 2019). It is unclear how high school science teachers perceive alternative grading in this type of test-driven environment (Barnes & Slate, 2013; Scogin et al., 2017; Ydessen & Andreasen, 2019).

Graduates of this test-driven approach, upon entering the workforce, many times lack problem-solving and critical thinking skills, as highlighted in the discussions and conclusions of several studies (e.g., Bowen & Peterson, 2019; Schmidt-Jones, 2017; Scogin et al., 2017; Wyatt & Nunn, 2019). Thurab-Nkhosi et al. (2018) suggested altering the goal of education to reflect settings and assessments that aim to develop competent, work-ready students, which indicated a need to investigate the perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning to potentially fill the gap in understanding. Specifically, there is a need to explore how teachers are assisting learners in reflecting and articulating knowledge gained in the educational setting and applying

those concepts in solving real-world and workplace problems (Bowen & Peterson, 2019; Kashani-Vahid, Afrooz, Shokoohi-Yekta, Kharrazi, & Ghobari, 2017).

Teachers use alternative grading, in the context of authentic learning, to foster self-reflection and the articulation of knowledge (Barber et al., 2015; Grainger & Weir, 2016; Herrington & Oliver, 2000; Moran et al., 2013). This development of self-reflection and articulation is achieved through scaffolding dialogue between teachers and students so that the educator can match the academic performance of students to a set of educational standards (Barber et al., 2015; Grainger & Weir, 2016; Herrington & Oliver, 2000; Moran et al., 2013). Although previous literature (Ott et al., 2018; Thibodeaux et al., 2019; Widiastuti, 2018) has provided information about student self-reflection and knowledge articulation in authentic learning contexts, there is a lack of data on the perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning.

Egan et al. (2017) reported that little is known about educator responses to the process of alternative grading, thus indicating a need to explore the topic further. There is evidence regarding the influence that authentic learning environments and alternative grading have on building student skills and the transference of those skills to the real world (Bektas, 2019; Percell, 2017; Zwahlen, 2018). However, there remains a gap in the literature regarding the perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning (Bektas, 2019; Percell, 2017; Zwahlen, 2018). I conducted this qualitative

interview study to address the gap in the literature and elicit a better understanding of alternative grading and assessment.

One goal in education is the development of competent individuals who can enter the workforce. This goal requires teachers who are assisting students in developing the critical skills that would allow them to compete in the workforce. Thurab-Nkhosi et al. (2018) indicated that educators should strive to develop skilled, real-world learners. Their findings provide support for the development of authentic learning environments and use of alternative grading practices (Thurab-Nkhosi et al., 2018). Other researchers, too, have found that either alternative grading methods or authentic learning environments are useful educational tools for improving student preparedness in transferring their knowledge from the classroom setting to the workplace setting to address real-life experiences (Egan et al., 2017; Lee et al., 2016; Mawson & Haworth, 2018; Moore & Morton, 2017; Percell, 2017; van Wessel, 2018). Egan et al. (2017) indicated that little was known, however, about the reactions of educators to alternative grading procedures, suggesting a need to investigate the subject further.

Many researchers have addressed the impact that authentic learning settings or alternative grading have on enhancing student abilities and transferring those abilities to solving real-world issues. However, there remains a gap in the literature that focuses on the incorporation of alternative grading techniques in an authentic learning environment (Bektas, 2019; Percell, 2017; Zwahlen, 2018). To address the gap in the literature, I conducted this qualitative study to explore the perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student

articulation of their learning. The remainder of this chapter is divided into four sections beginning with the literature search strategy applied to the study; the conceptual framework; a section on the literature review related to the four key concepts in the study: alternative grading, authentic learning, self-reflection, and articulation; and, last, a summary and conclusion of the chapter.

Literature Search Strategy

I searched for literature between February and September 2019 using databases provided by Walden University Library. The databases included ERIC, Google Scholar, Education Source, ProQuest Educational Journals, SAGE Premier, Expanded Academic ASAP, the Social Sciences Citation Index, Academic Search Complete, Communication and Mass Media Complete, and the Directory of Open Access Journals. These databases were used to locate peer-reviewed, scholarly literature focused on alternative grading and authentic learning environments. The keywords used to perform the search were *grading practices, authentic learning, authentic learning environment, alternative grading, grading systems, self-reflection, tacit knowledge, knowledge articulation, oral communication, verbal skills, formative assessment, critical self-reflection, performance-based learning, mastery-based learning, student performance, assessment, feedback, alternative assessment, grade point average, flipped classroom, grade policy, grade inflation, No Child Left Behind, testing, Instructional Design Theory, testing culture, and grade function.*

To identify landmark studies related to my topic, I analyzed the reference lists in the original scholarly articles that focused on alternative grading. I then compiled a list of

frequently referenced studies based on the alternative grading keyword search results in ERIC, Google Scholar, and Education Source. I limited the research studies for the literature review to those published within the past 5 years. However, I reviewed older literature to provide a solid foundation of understanding of the scholarly history of alternative grading. Altogether, 122 peer reviewed journal articles, books, and publications were used to compile the literature review for this study. For organizational purposes, I maintained two separate matrixes. The first matrix was used for scholarly articles that would become an integral part of the literature review. The second matrix was used to track my searches using key terms, databases, and search engines.

Conceptual Framework

I used IDFALE, which was developed by Herrington and Oliver (2000), as the conceptual framework for this study. The IDFALE framework was helpful in identifying the fundamental aspects of situated learning. These fundamental aspects of situated learning are often translated into instructional strategies applicable in the classrooms of the science teachers. IDFALE consists of the following nine constructs:

- provide authentic contexts that reflect the way the knowledge will be used in real life,
- provide authentic activities,
- provide access to expert performances and the modeling of processes,
- provide multiple roles and perspectives,
- support collaborative construction of knowledge,
- promote reflection to enable abstractions to be formed,

- promote articulation to enable tacit knowledge to be made explicit,
- provide coaching and scaffolding by the teacher at critical times, and
- provide for authentic assessment of learning within the tasks (Herrington & Oliver, 2000).

I did not apply all the nine constructs. Only three constructs from the IDFALE model (Herrington & Oliver, 2000) were associated with the research questions. Those constructs were promoting authentic learning contexts for reflecting how knowledge may be applied in real life, promote reflection to enable abstractions to be formed, and promote articulation to enable tacit knowledge to be made explicit. These three constructs obtained from the IDFALE model provided the foundation for exploring high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning, which is the primary purpose of this study.

Herrington and Oliver's (2000) first construct—promoting authentic learning contexts for reflecting how knowledge may be applied in real life—was used in this study. A situated learning environment for accomplishing this purpose is supposed to offer a physical environment for reflecting on how knowledge can be applied in solving real-life issues (Sagita & Rahayu, 2019; Yahaya, Sattar, & Mohamad, 2017). Thus, there is a need for the utilization of numerous resources for developing and maintaining authentic contexts to preserve the real-life setting's complexity (Herrington & Oliver, 2000). A structural design offering an opportunity to simplify or fragment the learning environment is also required (Naeimi, Zare, Hormozi, Shaghghi, & Kaveh, 2011).

In preparing an authentic learning environment, it is essential to consider the provision of multiple perspectives and roles (Herrington & Oliver, 2000). This consideration includes the application of different aspects of education in the various topics presented to learners (Herrington & Oliver, 2000). This strategy is applied to create a deeper understanding of the material presented. It also promotes collaboration, which offers educators and learners an opportunity to express their knowledge of the topic across disciplines (Herrington & Oliver, 2000). Planning for an authentic learning environment may entail the provision of an opportunity for crisscrossing the instructional environment through numerous investigations to sustain repeated assessments (Teräs, Teräs, & Herrington, 2012). Authentic learning environments and contexts also promote collaborative knowledge development. Tasks developed for the group, organizing the classroom into different groups, and the development of a relevant incentive structure for rewarding group achievement is detailed and promoted in an authentic learning environment or context (Luo et al., 2017).

The second construct applied to this study was Herrington and Oliver's (2000) sixth construct, which focuses on reflection as a means to enable perception development by developing and promoting authentic tasks in authentic contexts (Herrington & Oliver, 2000). According to Naeimi et al. (2011) and Jackson, Tran, Wenderoth, and Doherty (2018), the authentic learning educational setting should promote student self-reflection by providing opportunities for students to compare themselves with peers and experts. This comparison, through collaborative groupings, enables the learners to reflect upon their achievements (Jackson et al., 2018; Naeimi et al., 2011). Various guidelines should

be followed in developing a learning environment that promotes authentic learning activities (Herrington & Oliver, 2000). These may include activities that are relevant to the world but are ill-defined in curriculum-based resources (Herrington & Oliver, 2000). When implementing authentic learning activities, there must be a single complex problem that needs student investigation within a sustained period of time (Herrington & Oliver, 2000). In these activities, students need an opportunity to define tasks and sub-tasks to accomplish the given activity. In doing so, they learn to detect relevant and irrelevant information (Herrington & Oliver, 2000). Also, these activities need to foster collaboration with educators and peers as well as provide tasks likely to be integrated across various disciplines (Teräs et al., 2012).

Finally, to address learning through self-reflection, Herrington and Oliver's (2000) IDFALE model provides a guideline for developing and implementing an authentic assessment of student learning as they perform given tasks. Throughout the learning process, a student ought to be provided with opportunities to become a competent performer, using the acquired knowledge to polish their performance. Complex and well-structured authentic challenges, with various scaffolded tasks, need to be provided for students to navigate. Through these challenges, the educator can determine the level of mastery displayed by the student. Assessments also need to be seamlessly assimilated with learning activities to measure student progress in real-time, providing multiple opportunities to articulate and reflect upon their learning achievement. To accurately gauge learning and mastery, outcomes need to incorporate an appropriate scoring criterion (Herrington & Oliver, 2000).

The third construct addressed in this study was Herrington and Oliver's (2000) seventh, promoting articulation for making tacit knowledge explicit. Herrington and Oliver (2000) define three guidelines that should be followed to achieve this goal. First, there is a need to provide a complex task that is inherent with learning objectives in which students have an opportunity to express themselves. Second, educators are encouraged, again, to facilitate collaboration and group work, thus emphasizing fostering social and individual understanding of complex problems. Third, educators should present opportunities for public presentations of findings/solutions to enable students to provide their arguments to justify their knowledge (Martínez-Argüelles, Fitó, & Planar-Erta, 2018). To ensure authentic outcomes, the educator should include modeling best practices for learners of different expertise levels. Modeling best practices provide students with an opportunity for information and story sharing, which facilitates access to real-life scenarios (Martínez-Argüelles et al., 2018). Educators should model best practices, as well as scaffolding, during critical instructional or conceptual development moments. Achieving this objective needs a complex, but open-ended, learning setting in which scaffolding, as well as training, is offered. Students should then be encouraged to emulate collaborative learning to assist in scaffolding and preparation. During the implementation of this type of learning style, the educator must be available to offer significant training as well as scaffolding assistance (Naeimi et al., 2011; Teräs et al., 2012).

The three constructs addressed above provided the foundation for the central research question and supporting questions in this study on how high school science

teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. The two supporting questions focused on how alternative grading supports student self-reflection and student articulation of their learning. Herrington and Oliver's instructional design is integrated into the research questions by default, as the questions were developed based on the constructs created by the authors. Through the authentic learning environment, student self-reflection, and student articulation of their learning will be addressed. It is understood that authentic learning, self-reflection, and student articulation of their learning form the key concepts of interest in this research (Herrington & Oliver, 2000).

Literature Review Related to Key Concepts

In this section, the supporting literature to address high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning were explored. The key concepts related to the study include grading practices, alternative grading, authentic learning, self-reflection, and articulation of learning. Each concept explored addressed either the central research question or the two supporting research questions.

A History of Grading Practices

In the teaching and learning process, assessments are a staple in curriculum development, and they are often representative of the society's cultural and economic characteristics (Siles-Gonzalez & Solano-Ruiz, 2016). It is crucial to understand the current implication of grades in culture and society, so an extensive and detailed description of the development of grading practices and authentic learning contexts must

be conducted to support the central concept of this research study; alternative grading methods used to support authentic learning.

The earliest recorded grading approach emerged at Harvard University in 1646, and it entailed a form of exit exams, which led to a degree being awarded (Schinske & Tanner, 2014; Smallwood, 1935). This grading approach transformed into a grading system, focusing on a four-point scale, developed by Yale University in 1785 (Bagg, 2009; Schinske & Tanner, 2014; Smallwood, 1935; Stiles & Dexter, 1901). Since the emergence of this four-point scale, several other categories of comparison or assessment have gained popularity in the educational setting. These include the development of a 100-point system of grading (percentage grading), the use of public rankings and evaluations, and the idea that attendance and conduct can be used to assess knowledge gains (Schinske & Tanner, 2014; Schneider & Hutt, 2014; Smallwood, 1935; Stiles & Dexter, 1901). Grading practice maturation culminated with the development of the currently used letter system (ABCDF) (Grant & Green, 2013; Schinske & Tanner, 2014; Schneider & Hutt, 2014). The (ABCDF) grading system was initially instated as a communication tool for institutions to avoid utilizing unreliable evaluations of students (Grant & Green, 2013; Schinske & Tanner, 2014; Schneider & Hutt, 2014).

Since the inception of grading practices, debates have emerged regarding the effectiveness and accuracy of grading approaches (Schinske & Tanner, 2014). Some researchers believe that grading approaches that produce lettered or numbered grades reduce motivation, foster damaging competition, negatively impacts effort, and cause psychological damage (Klapp, Cliffordson, & Gustafsson, 2016; Kohn, 1999; Schinske &

Tanner, 2014; Seymour & Hewitt, 1997; Tobias, 1990). Several studies go so far as to cite the competition mentioned above as a primary contributing factor in the decline of qualified and talented college students in the field of science (Klapp et al., 2016; Kohn, 1999; Schinske & Tanner, 2014; Seymour & Hewitt, 1997; Tobias, 1990). Conversely, other researchers and theorists believe systematic grading provides a comparison to promote motivation amongst the student body (Docan-Morgan, 2012). In response to the negative research surrounding the effects of grades on the student, the educational community sought out authentic alternatives to traditional grading approaches (Gulikers, Bastiaens, & Kirschner, 2004; Herrington, Oliver, & Reeves, 2010; Karim, Abduh, Manda, & Yunus, 2018; Wiggins, 2011).

Alternative Grading

The overarching research question addressed in this qualitative interview study was the following: How do high school science teachers perceive their implementation of alternative grading as support for authentic learning? This research question informs the choice of studies examined in the sections “alternative grading” and “authentic learning,” as both topics are represented in the actual question. Alternative grading methods refer to a non-traditional approach to grading. It is defined as a set of practices or techniques used in assessing the academic performance of a student. The methods used to evaluate academic achievement include activities requiring the application of acquired knowledge and skills to real-world situations, and that is often seen as an alternative to standardized testing” (*Authentic Assessment* Merriam-Webster [Def 1], 2019; Gozuyesil & Tanriseven, 2017). In scholarly literature, alternative grading methods are referred to as alternative

assessment and authentic assessment. In this literature review, both alternative grading and alternative assessment will be utilized to refer to studies addressing the topic.

Alternative grading methods were developed out of a need for the educational community to respond to the global educational reform that was initiated in the early 1990s, which focused on competency-based curriculum and assessments (Gulikers et al., 2004; Koh, 2017). The goal of developing alternative grading methods was to “provide students with ample opportunity to engage in authentic tasks to develop, use, and extend their knowledge, higher-order thinking, and other 21st-century competencies” (Koh, 2017, p. 4). The reasoning behind developing a real-world situation was that the educators could provide the students with activities resembling tasks that the student would encounter in their professional practice (Koh, 2017). This design provides the students with the opportunity to integrate learning and training so that they can develop some of the following skills: “critical and creative thinking, complex problem solving, effective communication, collaboration, self-directed and lifelong learning, responsible citizenship, and technological information literacy” (Koh, 2017, p. 2).

Alternative grading methods are often used to assess learning in authentic learning environments (Gozuyesil & Tanriseven, 2017; Koh, 2017), with alternative grading methods including essay responses, oral presentations, self and peer-reflection, portfolios of compiled work, and practical demonstrations of gained knowledge (Gozuyesil & Tanriseven, 2017; Kosteklioglu & Celen, 2016). These grading methods align with Herrington and Oliver’s (2000) IDFALE, focusing on the students’ ability to reflect on their learning and articulate gains in knowledge.

Alternative grading methods differ from standardized assessments in the fact that they “provide flexible and meaningful learning experiences that take into consideration the learning style of the students” (Gozuyesil & Tanriseven, 2017, p. 38). The main differences include the use of rubrics, narratives, feedback, self, and peer evaluation, and performance mastery/observations to provide an overview of student success matched against a specific learning strand (Gozuyesil & Tanriseven, 2017; Greenstein, 2010; Koh, 2017). In contemporary literature, alternative grading is referred to as authentic or alternative assessment, and it is often employed in authentic learning environments.

In the current literature, various studies discuss the significance of alternative grading and authentic learning. For example, in a quantitative research study, Kinay and Bagceci (2016) investigated the effects of using authentic assessment on prospective teacher's problem-solving skills. In the study, 85 potential teacher candidates in Turkey were split into two groups: Group A was the control group consisting of 43 students, and Group B was the experimental group consisting of 42 students (Kinay & Bagceci, 2016). The experimental group was provided instruction mimicking an authentic learning environment while Group B experienced the traditional educational setting of lecture, discussion, and question asking (Kinay & Bagceci, 2016). Findings indicated that "there had been a significant increase in the perception for problem-solving skills of the experimental group compared to their conditions prior to the study" (Kinay & Bagceci, 2016, p. 56). The control group had no change between the pre and posttest administration (Kinay & Bagceci, 2016). Thus, indicating that both authentic learning environments and alternative assessments provide a setting that fosters problem-solving

skills. These findings align with Herrington and Oliver's (2000) construct that promoting authentic learning contexts for students helps to transfer learned skills into real-life applications.

In addition to improving cognitive skills such as problem-solving and critical thinking, as noted in the study above, administering alternative assessments also promotes a deep understanding of learning, as seen in the following quantitative study conducted by Kang et al. (2019). Kang et al. (2019) investigated the use of oral examinations as an alternative assessment tool. Kang et al. (2019) examined how the implementation of an oral examination impacted the student and teacher's assistant (TA) experience. More than 400 individuals participated in the study, with data collected via surveys. Findings indicated the following;

1. Oral assessments had benefits for both the student and the Tas.
2. The oral examination format improved student understanding of concepts and promote retention of learned material.
3. Oral examinations reduced grading time and grade load (Kang, et al., 2019).

One drawback noted in the findings was that, due to the unknown nature of the oral examination, anxiety levels before the exam were high and may have hindered performance for some (Kang et al., 2019). The findings from Kang et al.'s study inform the present research investigation by providing pros and cons related to student performance on alternative assessments. These findings were used to develop interview questions associated with exploring how educators promote articulation to enable learned knowledge to be made explicit in authentic learning settings (Herrington & Oliver, 2000).

Another study illustrating the effect of using alternative grading measures to develop a deep understanding in students comes in the form of a meta-analysis of the literature, carried out by Gozuyesil and Tanriseven (2017), specific to the implementation of alternative grading techniques. They investigated the effectiveness of alternative assessment techniques through this meta-analysis. The authors analyzed 26 studies employing various alternative assessment techniques. The findings indicated that the most commonly applied alternative assessment technique was the use of portfolios, followed by peer and self-assessment, and finally, only self-assessment. Regardless of the method employed, all studies showed a significant positive impact on academic achievement (Gozuyesil & Tanriseven, 2017). This meta-analysis encompasses the entirety of the underpinnings of this study. The literature, like this meta-analysis shows, has focused heavily on the effects of alternative grading methods and techniques on academic achievement. However, very little was known about high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning.

Despite the previous studies illustrating the benefits of administering alternative assessments, it is still not a common practice in the classroom. A reason cited for the apprehension of the use of alternative assessments in the classroom is often related to a lack of training and understanding of the benefits associated with the implementation of alternative assessments. An example of this issue is highlighted in a qualitative research study conducted by Kaya (2018). Kaya (2018) investigated primary school educators'

opinions on alternative assessment. In the study, ten primary school educators were interviewed. Findings indicated the following;

1. “Preschool teachers frequently used play-based assessment from alternative assessment approaches, and they also stated that they had acquired concrete information through recognition and assessment of children through play” (Kaya, 2018, p. 2297).
2. Primary schoolteachers collect portfolios for students but do not use portfolios as assessment tools.

The cited reason for the limited use of alternative assessment, as stated by Kaya (2018), is that the educators do not feel as though they are adequately trained to implement alternative assessments in the classroom. This study explores the gap in the research focusing on the limited information relating to high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning. Looking at the opinions of teachers simply implementing alternative assessment does not provide a complete picture of the implementation of alternative assessment techniques to support authentic learning. As a result, investigating the perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning was a critical missing piece of information that needed to be explored so that educators would have scholarly work related to the subject when designing and implementing an authentic learning environments.

The apprehension in the implementation of alternative grading methods is not specific to one country or educational system. The lack of application is seen across the globe in various educational systems. For example, in a qualitative research case study, Demir, Tananis, and Basbogaoglu (2018) compared the implementation of alternative assessment techniques for elementary mathematics classrooms in the US and Turkish classes. According to Demir et al., (2018), "document examinations, semi-structured observations and semi-structured interviews were conducted to determine and compare the level of applicability of alternative assessment methods in 4th-grade mathematics courses" (p. 80). A total of six elementary schools in Turkey were used, and four elementary schools in the United States were used. Findings indicated US schoolteachers implemented performance tasks, observations, portfolios, presentations, projects, rubrics, and self- and peer assessments while Turkish schools did not. The cited reason for the failure to implement alternative assessment techniques in the classroom was a lack of training. This study shows that alternative grading techniques are frequently used in American classrooms, but no information is provided about high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning. This study addressed that gap.

Lack of training in implementation is not always the reason for the lack of application of alternative grading methods. Sometimes, teachers who wish to use alternative assessments may not necessarily utilize the concept due to other classroom, or system, related challenges, as seen in the quantitative study conducted by Kolomuc (2017), with 80 subject-specific science educators using alternative assessment. Findings

indicated that, although "the subject-specific science teachers under investigation stated their wishes to employ alternative assessment techniques in their careers/classes" (Kolomuc, 2017, p. 8), they did not. It was also noted that the educators in the study used traditional grading methods such as multiple-choice tests, concept maps, short answer, and matching test. The reason cited for this is due to the high stakes testing that occurs in the country (Kolomuc, 2017, p. 8); a deviation in practice may show an inability to perform in the classroom. Kolomuc (2017) noted that a "lack of knowledge of alternative assessment calls for a provisional approach for integrating into science classes through the implementation of in-service education" (Kolomuc, 2017, p. 8). Kolomuc's (2017) study illustrates the lack of knowledge that the educational community had surrounding the implementation of alternative grading techniques in authentic learning environments, thus justifying the need for this study.

By analyzing the current literature, a pattern emerged; teachers have research that supports the idea that the use of alternative assessment promotes academic success, and teachers often cite a lack of training as a reason for not implementing alternative assessment methods to support the educational environment. With a clearly defined learning outcome and robust instructional design, research indicated that students could articulate learned information, properly navigate open-ended exercises, and accurately complete extended-response exercises and tasks (Anderson, 2018; Merritt, 2019; Thibodeaux et al., 2019). Using this guideline provides a means for educators to facilitate alternative grading methods in authentic learning through observations, the assignment of practical project work, journaling, and self-reflection (Merritt, 2019; O'Connor, 2017;

Starko, 2017). It is suggested that these alternative grading methods complement the authentic learning experience and help students and educators to experience, manipulate, and work through real-life situations so that students are better prepared for the workforce (Cetinkaya, 2018; Merritt, 2019; Percell, 2017; Schmidt-Jones, 2017).

In every study reviewed, authentic learning was the setting for implementation. Thus, a need to explore teacher perceptions of the implementation of alternative grading to support authentic learning was required.

Authentic Learning

Current research indicates that Herrington and Oliver's (2000) IDFALE constructs are used as a guide for developing assessments and learning in the authentic learning educational environment (Ghosh, Bowles, Ranmuthugala, & Brooks, 2017; McKenney & Reeves, 2019). Herrington and Oliver's (2000) IDFALE is used in the development of virtual laboratories in engineering courses, it is used as the framework for the academic use of social media platforms, and it is used in the development and implementation of flipped classrooms for the application of problem-solving or case-based scenarios (Cremers, Wals, Wesselink, & Mulder, 2016; Diwakar & Noronha, 2018; Kimmons & Veletsianos, 2016; Sharma, Lau, Doherty, & Harbutt, 2015). As this present study utilizes Herrington and Oliver's (2000) theory of IDFALE for the conceptual framework, it is imperative that an understanding of learning environment design is attained. Authentic learning environments require a great deal of prior knowledge to properly implement the environment, assess learning, and properly implement tasks that

mimic real-world activities. The following research focuses on the development and implementation of authentic learning environments.

Research indicated that authentic learning and alternative grading methods are hot topics in education due to the noted ill-preparation of college graduates (Brewer & deMarrais, 2015; Cremers et al., 2016; Link, 2018). The most often cited criticism of these graduates is their inability to perform and navigate real-world workforce setting issues (Baeten, Dochy, Struyven, Parmentier, & Vanderbruggen, 2016; Cremers et al., 2016; Sharma et al., 2015). For example, a meta-analysis conducted by Ghosh, Bowles, Ranmuthugala, and Brooks (2017) examined the effects of alternative assessment on seafarer training. The study focused on tools that could be used to provide meaningful instructions. The tools promoted were alternative assessments in an authentic learning environment (Ghosh et al., 2017). Findings indicated that classrooms that utilized alternative assessment and authentic learning environments supported the following features:

- 1) tasks that are set in a real-world context,
- 2) processes that require performance criteria to be provided beforehand, with on-hand training in a real-world context, and
- 3) outcomes that engage student meaningful education that promotes critical thinking and problem-solving training, which can be transferred to a real-world setting (Ghosh et al., 2017).

This meta-analysis addressed the benefits associated with utilizing alternative grading in authentic learning. However, no data was collected regarding the perceptions of educators carrying out these tasks in their classrooms.

Since the inception of authentic learning environments, they have been studied and investigated. Understanding educator perceptions of authentic learning environments is a critical part of this study. By examining the findings of Bektas's (2019) qualitative phenomenological study, an insight into teacher candidates' metaphorical perceptions related to the notion of authentic learning, can be gained. Bektas (2019) surveyed 66 teacher candidates to discover their understanding and definition of authentic learning environments. Findings provided a variety of teacher candidate descriptions of authentic learning. For example, an understanding of the tie between authentic learning and the real-world workforce was described in two separate contexts, first "authentic learning provides the teachers with an opportunity of bringing the outside world into the class," and second "authentic learning has the feature of the richness in terms of providing to learners with experiences in different environments" (Bektas, 2019, pp. 89-91).

Candidates in the study also described authentic learning as a collaborative and integrative process. For example, a candidate in the study described authentic learning in the following way, "authentic learning has the feature of learner's transferring his/her knowledge to the new learning and lives" (Bektas, 2019, pp. 89-91). Bektas (2019) concluded the study with a suggestion for future research and education, providing teachers with training in conducting an authentic learning environment. This study highlights the thoughts and understandings of teachers who implement authentic learning.

What is missing is the educators' perceptions of alternative assessment as support in an authentic learning environment.

Most scholarly writing involving the implementation of both alternative grading and an authentic learning environment focuses on student success and student educational games. For example, in a mixed-methods study, Sabtiawan, Yuanita, and Rahayu (2019) explored the effectiveness of alternative assessment in authentic learning environments through the lens of the student. Sabtiawan et al. (2019) examined student performance, students' attitudes, and limiting factors in authentic assessment implementation (p.156). The authors observed, tested, and interviewed 37 university students. Findings were provided in three sections, based on the research subject being examined. First, student performance; alternative assessment facilitated student performance, positively impacting fluency scores (Sabtiawan et al., 2019). Second, students' attitudes, both an interest in the topic and enjoyment of learning, were reported positively for the study (Sabtiawan et al., 2019). Finally, Sabtiawan et al. (2019) reported on prohibitive factors. These factors were represented by "obstacles" in the study. They were reported as "difficulties in promoting students' enjoyment at the initial moments, and a difficulty to motivate the students to pose questions and ideas at the initial moments" (Sabtiawan et al., 2019, p. 172). Sabtiawan et al. 's (2019) research study explored the implementation of alternative assessment via the scope of the student. Again, highlighting the missing research information that is the perceptions of educators using alternative grading methods to support authentic learning environments.

Another study focusing on authentic learning, through the lens of the student, was conducted by Baeten et al., (2016). Baeten et al. (2016) addressed student-teacher instructional preferences and approaches to learning in student-centered learning environments. In this quantitative research study, Baeten et al. (2016) administered a questionnaire to first- and second-year students in education programs. A total of 760 students from 10 different universities were included in the study, to understand student teachers' instructional preferences and approaches to learning (Baeten et al., 2016, p. 56). Regarding instructional preferences, findings indicated that teacher students preferred direct instruction where the educator provides structure, guidance, and support (Baeten et al., 2016, p. 56). Teacher students also stated that, although they prefer to direct instruction, they also like to incorporate cooperative learning, where students engage in authentic learning through group work, discussion, and application (Baeten et al., 2016, p. 56).

Regarding instructional approaches, findings indicated that teacher students preferred “a deep approach to learning, through which they look for relationships in learning content and searching for meaning” (Baeten et al., 2016, p. 57). Again, through this study, a missing piece of information is provided; student educators prefer direct instruction in the classroom, but cooperative learning in performance tasks. This mix of instructional practices and performance tasks is not unlike many studies in this literature review, with an often-cited reluctance to incorporate authentic learning or alternative assessment due to a lack of training or knowledge about the methods. Hence, conducting a study focusing on teacher perceptions of their use of alternative grading to support

authentic learning was critical. It provided knowledge in an area that has a gap in understanding.

Thurab-Nkhosi et al. (2018) also conducted a student-focused investigation into the effects of the implementation of authentic learning environments with alternative grading methods applied. This qualitative research study investigated these five components: “task, physical context, social context, assessment result or form, and criteria and standards” (Thurab-Nkhosi et al., 2018, p. 660) to gauge perceptions on authenticity. Findings indicated that authentic learning environments “encourage perceptions of competencies and build the confidence of students” (Thurab-Nkhosi et al., 2018, p. 660). However, the authors also noted that a considerable amount of inquiry into the application of authentic learning environments is needed to implement the environment properly. Thurab-Nkhosi et al. (2018) also stated that students were unprepared for the heavy workload associated with an authentic learning environment. The findings are in line with the previous studies focused on student perceptions of authentic learning environments. Still, they lack information related to high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning. This indicated that an investigation to fill the gap needed to be conducted.

Self-Reflection

In this section, the research that supports how alternative grading encourages student self-reflection is addressed. It is imperative to analyze articles related to self-reflection to provide a history of the perceptions of the use of reflective practices.

Because self-reflection is a form of alternative grading, the investigation into studies focused on self-reflection is critical for alignment.

Reflection is fundamental in authentic learning environments (Eather, Riley, Miller, & Imig, 2019). Authentic tasks that are assessed via alternative grading methods are a requirement when providing students with opportunities to reflect on their learning process (Dignath & Buttner, 2018; Steiner, 2016). According to Peltola (2018), authentic learning tasks encompass student interactions, real-life projects, and self-reflection on individual learning experiences. Theorists such as Dewey (1933), Schon (1987), Kolb (1984), and Bradbury (2010) view reflection as a product and a process in the learning environment. Reflection is not a single activity for self-assessment, as the name suggests (Larsen, London, & Emke, 2016). Reflection is a skill used by the individual that helps them to understand how they process and interpret information (Larsen et al., 2016). Research also supports the idea that reflection is a social process, and that this process requires collaboration on given tasks to make the reflective process more apparent (Carlson, 2019; Peltola, 2018).

Across the learning environments, opportunities for student self-reflection are minimal (Karabulut-Ilgu, Yao, Savolainen, & Jähren, 2018). In the classroom, the emphasis is placed on learning content, with few opportunities for collaboration, thus hindering social self-reflection among students (Karabulut-Ilgu et al., 2018; Ott et al., 2018; Shafeek et al., 2019). Peltola (2018) stated that authentic, meaningful activities that are completed with the students having access to expert knowledge are recommended to facilitate student self-reflection. Having a setting where students get to compare

themselves with experts is critical in self-reflection (Carlson, 2019). Carlson (2019) also stated that students have the opportunity to reflect on the learning content socially while engaging in meaningful negotiations on emerging problems. Some of the activities that can offer students opportunities for social self-reflection include Weblogs, Journals, and portfolios. In discussing different types of formative assessments, Shafeek et al. (2019), stated that self-reflection allows learners to integrate theory and real-life practice. This integration aids students in learning, from personal experiences, how to modify their actions; thus, affecting future outcomes (Shafeek et al., 2019).

Most current research on reflective practices focuses on pre or in-service teachers. There is a limited amount of work focusing specifically on the use of self-reflection in authentic learning environments. The ensuing studies provide examples of the focus of current literature on reflective practices.

Self-reflection is used as a form of alternative assessment. For example, in a qualitative research study, Korkko, Kyro-Ammala, and Turunen (2016) examined 13 student teachers' reflective portfolios. In this study, data were collected over a four to five-year period. Data came in the form of accumulated self-reflection teacher students' portfolios. In these portfolios, the students reflected on their learning experience, teacher identity, and general educational practices. After coding the data, Korkko et al. (2016) discovered that "during this process of reflection, the student teachers' perceptions of their teaching profession expanded, and they began perceiving themselves not only as teachers but also as educators" (p. 204). Despite the focus of this research aiming at improving educational programs, a secondary finding, noting the significance of self-

reflection in enhancing student teachers' perceptions of themselves and their instructional practice, was provided. This data would not have been available without the use of self-reflection. Through self-reflection, these student educators were able to move from the self and expand reflection to encompass "their pupils, the classrooms and the school community and society" (Korkko et al., 2016, p. 204). Again, a pattern emerged where alternative assessment provided a solid foundation for expanding upon learned information in the form of practical application.

Using reflective practices as a means of alternative assessment often increases understanding and deep learning. An example of this comes in the form of a mixed-methods study supporting the idea of self-reflection as an integral part of developing knowledge, understanding, and application, Slade, Burnham, Catalana, and Waters (2019) analyzed reflective journals from 243 undergraduate teacher students. Overall findings indicated that "reflective practice directly impacts teacher candidates' knowledge, skills, and dispositions related to pre-K-12 education" (Slade et al., 2019, p. 6). In their discussion, Slade et al. (2019) stated: "perhaps the most promising aspect of using reflective practice in teacher preparation is the potential for enhancing students' acquisition of knowledge and skills" (p. 6). This simple result supports a plethora of work dating from the early 1980s and continuing now, which states that reflective practices support authentic learning and the acquisition of a deep understanding of information learned. Five additional points were noted as results for the study;

"Reflective practice can positively impact students' perceptions of target subject matter. The practice of reflection provides opportunities for firsthand experiences

in real-world applications of knowledge and skill. Reflective practice may result in self-professed changes in personal belief systems and world views. Reflective practice can support students' ability to overcome apprehension and fear of performing in real-world settings, and reflective practice may lead to the affirmation, modification, or change of career paths" (Slade et al., 2019, pp. 6-7).

These findings supported the central concept of sub-question one for the research, highlighting the use of self-reflection to support authentic learning.

Another study focusing on the positive effects of self-reflection on student achievement and success is highlighted in a mixed-methods study focused on student teachers from Iqbal (2017), where he analyzed reflection-in-action. In this study, Iqbal (2017) surveyed 800 student teachers via questionnaire and then observed the reflection practices of 10% of the study population. Iqbal's (2017) findings indicated the following "student teachers regarded reflection-in-action as a fundamental quality to get self-awareness, which was developed through the reflective practicum course" (p. 76). Self-reflection was also referred to as the "panacea for effective teaching" (Iqbal, 2017, p. 77) in this study, with the benefits of self-reflection listed as the following:

Reflective practices raised the student's self-confidence in learning that takes place outside the university. Reflection-in-action empowered student teachers to assess their learning and gain academic recognition in reward. Reflection-in-action caused student teachers to identify and rectify their professional mistakes, which lead them towards professional development. Reflective teachers can find out the rationale of their teaching practices by developing a deeper understanding

about their teaching style. Significant relationship between involvement of teachers in reflection-in-action and better management within the class. (Iqbal, 2017, p. 77)

However, Iqbal (2017) also noted that "reflection requires refined pedagogy" (p. 77). Referring to refined pedagogy indicates that teachers may not have the background knowledge or proper training to implement reflective practices in their work. Again, this references the gap in the literature. There is an abundance of material focusing on teacher students and their use of reflective practices through undergraduate programs. However, the use of reflective practices in action in a classroom is limited. The sub-question addressed at the beginning of this portion of the literature review, focusing on high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning was explored to provide research and information to help fill the gap in literature.

In a switch from the previous studies focusing on the benefits of self-reflection for students in the class, the following research addresses reflective practices for educators. This study provides evidence that reflective practices increase preparedness for educators and provide an avenue for educators to examine and change ineffective teaching strategies. In a qualitative research study focused on blog-mediated reflection for professional development, Tajeddin and Aghababazadeh (2018), analyzed reflective blogs from 32 EFL teachers. Through critical reflective practices, teachers were able to explore and report issues related to "including learners' classroom participation and responsibility, development of learners' language skills, raising learners' motivation and

self-confidence, classroom management, use of L1, and classroom facilities, working conditions, textbook and syllabus, teaching methods and strategies, and teachers' instructional ethics" (Tajeddin & Aghababazadeh, 2018, p. 45). One implication of the study was that "Teachers should be informed that, through regular reflection on their teaching, they can gradually identify sources of problems in their classes and better prepare themselves to face them" (Tajeddin & Aghababazadeh, 2018, p. 46). This suggestion highlights the importance of critical self-reflection in relation to the field of education, for both educators and students alike. These findings also supported the research focus for this study by addressing critical self-reflection as a tool to use to improve learning and understanding in authentic learning environments.

Reflective practices not only improve understanding, but they also provide a means for educators to enhance writing skills. A critical study that includes information on self-reflective practices in education comes from Demmans Epp, Akcayir, and Phirangee (2019). In this mixed-methods study, the authors investigated the effect of reflective writing practices, including peer review, on students' reflective writing, and writing quality scores in a computer science program. Although the primary focus of this study was to investigate writing quality, the aspect of reflective practices was a significant portion of the research questions. Findings indicated that reflective practices and peer feedback had minimal effect on writing quality. However, the most significant applicable part of the study was the suggestion for future research studies section. Demmans Epp et al. (2019) stated the following; "further studies need to keep investigating new approaches in terms of timing, guidelines, and supportive tools to

promote reflective writing to determine which activity designs facilitate student improvement" (p. 540). In this study, the understanding that reflective practices are critical in the development of writing skills is noted. Still, the effect of self-reflection in developing those skills is absent from the findings. These findings and suggestions informed the present study by revealing the gap that would be investigated through researching the perceptions of teachers using self-reflection to support authentic learning environments.

Upon review, previous literature indicates students engaged in self-reflection develop abilities as well as attributes linking theory delivered in classrooms and practice outside the classroom context. It is implying that the completion of complex learning challenges found in authentic learning contexts is fundamental and does not require a request from an external agent. As stated earlier, Korkko et al., (2016) revealed that reflective practices in professional courses that require the analysis of different learning sessions by students promote peer and instructor feedback that is fundamental to student success. Reflective practices also provide an avenue for students to gain insight into enhanced academic performance by critically analyzing individual efforts and altering the way they examine concepts taught (Cavilla, 2017). Finally, in an authentic learning environment, self-reflective practices with active instructor feedback, and instructor commentary facilitate knowledge acquisition by allowing the learner to identify their areas of strengths and weaknesses (Eather et al., 2019). Regardless of research on self-reflection in authentic learning, no study was found examining how self-reflection, an

element of ALE, can be improved. This lack of evidence was a critical missing piece in understanding practices, and it was addressed by this study.

Articulation of Learning

In this section, the research sub-question “what are the perceptions of high school science teachers regarding how alternative grading supports student articulation of their learning?” is addressed via current scholarly literature on the use of articulation in traditional and authentic learning environments. A quick search in academic research focusing on articulation revealed the limited number of scholarly articles available on this topic. Similar to alternative grading, specific inquiries into the subject of articulation are sparse. Most scholarly writing addresses articulation as it relates to speech therapy, nursing practices, or the learning of a new language. An expanded search encompassing performance assessment and communication skills provided more data on the topic than articulation alone. Also, when investigating the use of articulation in the form of oral communication, an often-cited accompaniment is peer and self-reflection, which forces the student to evaluate themselves more critically (Hynes & Kwon, 2018; Murillo-Zamorano & Montanero, 2018; Nikolic, Stirling, & Ros, 2018). As alternative assessment is a focal point in the literature, it is important to note how two varieties of alternative assessment are inextricably linked in scholarly research.

The main research question governing this study examines the perceptions of high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning. Thus, it is essential to investigate articulation and communication skills in the scientific

community as well as the educational community. In several studies, it is noted that there is a gap in performance and understanding surround communication skills.

Past and present-day scientists often lack the basic skills necessary to relay scientific information to the public, between institutions properly, and within the scientific community (Cleveland & Reinsvold, 2017; Cooke et al., 2017; Rajput, 2017; Train & Miyamoto, 2017). This lack of oral and communication skills is confounding. Most higher education institutions consider verbal communication skills to be essential tools graduates must possess to enter the workforce (McDougall & Holden, 2017). The studies reported on above illustrate that verbal communication skills are the very skills that are underdeveloped and underused in many educational institutions.

Due to issues with planning and a lack of general knowledge of the benefits of performance assessment, a form of alternative assessment, it is not often employed in the classroom. To illustrate the benefits of performance assessment, concerning the articulation of knowledge, Isnaeni, Wulan, and Solihat (2017) conducted a quantitative research study focusing on the effect of performance assessment on students' communication skills. The population for this study was 32 high school science students. The study investigated four components related to performance assessment; "Articulate thoughts and ideas effectively. Listen effectively. Use communication for a range of purposes. communicate effectively in diverse environments" (p. 24). These components were to be studied through an assignment based on creating a presentation on the water cycle. Findings related to the idea of "articulate thoughts and ideas effectively" (Isnaeni et al., 2017) showed that students were less inclined to express knowledge on the water

cycle orally. The authors also noted that students were better equipped to articulate how they created their water cycle project, rather than relay the learned information on the topic. This highlights an area for improvement and direction that educators should investigate to improve best practices. By addressing the benefits and limitations of performance assessment (a form of alternative assessment), this study's aim was to fill the gap in the literature focusing on high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning.

Current literature also notes the drawbacks to the utilization of performance assessment in the learning environment. Many educators lack the preparation time required to implement oral examinations properly, and as a result, students are unable to develop this skill. Through a quantitative study, Villaber and Gonzaga (2018) investigated the effect of oral examinations on the communication skills of a group of 379 college students. Findings indicated that students felt that oral examinations improved their understanding of communication skills. Teacher administering the tests also felt communication skills improved and that students were better able to practice the knowledge gained through verbalization. Both the teachers and students who participated in the study noted that oral examinations are time-consuming and cause anxiety. Villaber and Gonzaga (2018) concluded with the following suggestion: "the conduct of the oral examination should be continued to enhance students' communication skills and improve speaking performance" (p. 39). The findings here, and in several other studies, indicate that the use of oral examinations where students have to articulate learned information is

not often used. Student anxiety associated with oral examinations is also a recurring theme. Addressing the use of alternative assessments, like oral examinations, to support authentic learning, was thoroughly explored to address this gap in the lack of understanding.

Investigating alternative assessment also provided links between tools used by educators in the authentic learning setting. When examining reflective practices and articulation, it is noted that these two tools are often used together to obtain a more rounded picture of student performance. For example, Murillo-Zamorano and Montanero (2018) conducted a study addressing oral presentations in higher education. In the study, the authors also examined the effect of peer and teacher feedback on oral presentation proficiency. In this quantitative study, they examined 96 recorded oral presentations from 32 students. This study was conducted in a pretest/feedback/post-test fashion. Findings from the pretests highlight essential gaps in the student verbal skills. These gaps include;

They were unable to format a presentation. They were unable to develop the full scope of topics their projects addressed. Their verbal and non-verbal communication was usually monotonous and inarticulate. Time management was ineffective with several students rushing to stay within the time constraints; rushing to finish without properly explaining the main conclusions. (p. 143)

Upon completion of the pretests, the students were either provided with peer or teacher feedback. Based on the feedback, the students then adjusted their presentations. The group who received peer feedback scored significantly higher on their post-test than the group that received instructor feedback.

These findings suggest that collaboration is a crucial component in the development of oral presentation skills. Collaboration and oral assessment constitute a significant component of alternative assessment. By investigating the use of alternative assessments to support authentic learning, an understanding of the potential benefits of the implementation of alternative grading was provided to teachers wishing to adjust their educational practices.

The type of classroom the student or teacher is in may also provide a barrier for the use of articulation in the educational setting. The increasing use of online degrees and classes limit practice in communication, as education is usually autonomous. To further investigate this phenomenon, McDougall and Holden (2017) analyzed the oral presentation skills of a group of college students enrolled in an online college program. Portfolios from 56 students were analyzed, coded, and reviewed, and three interviews were conducted. Consistent with the findings of the previous studies discussed in this section, the peer and self-assessment documents in the portfolio seemed to be of utmost importance to both the students and the authors of the study. Findings related to the analysis of portfolios and interviews indicated the following; “many distance education students appeared to go ‘above and beyond’ in their efforts because they recognized the real-life significance of developing these skills and the opportunity for self-improvement” (p. 174). McDougall and Holden’s (2017) study also revealed that student autonomy and the consideration of valuing life experience had a significant effect on student outcomes. McDougall and Holden (2017) suggested that placing value on the students' interests and providing them with opportunities to highlight previously acquired knowledge through

new presentations delivered positive outcomes in the learning environment. Creating this learning environment, which emphasized the student as a sum of their experiences, also provided students with a setting to practice and hone in on the necessary skills for oral presentations without the pressures of the real-world workforce.

McDougall and Holden (2017) note that research focused on oral presentations and articulation skills are limited, echoing the statements that opened this section of the literature review. With such a limited scope of information on the subject of articulation, exploring the perceptions of the use of alternative gradings, such as oral presentations, to support authentic learning helped to fill the gap in the literature. The present study aimed to accomplish this goal.

To combat the dropping fluency rates surrounding communication skills (articulation of knowledge), many educational institutions have developed an initiative to investigate the implementation of alternative practices to increase student performance. For example, in a quantitative study conducted by McLaren (2019) explored science student responses to the implementation of an oral skills development initiative in a college setting. In this study, 34 Chemistry students were introduced to an oral skills development initiative. This initiative involved integrating presentations, discussions, speech activities, and oral reports into the Chemistry curriculum. The study was conducted over ten weeks and not only addressed students' oral communication skills but their attitudes and motivation as well. Findings indicated that a significant positive change in student attitudes and motivation encouraged growth and understanding.

The findings also showed that communication and oral presentation skills improved considerably. Again, similar to the studies above, self-assessment was a tool used to measure student outcomes. In McLaren's (2019) study, the questionnaire filled out by the participants is viewed as a form of self-assessment, tying the findings of this study back to the idea of implementing alternative assessment in an authentic setting. The literature shows the benefits of articulation activities on student performance. However, many of these studies are not conducted in authentic learning environments and are specific to certain populations. Additionally, no investigation aimed to investigate teacher perceptions of the use of articulation practices to support authentic learning. Therefore, conducting this inquiry into teacher perceptions of the use of articulation practices to support authentic learning was warranted to fill the gap in the literature.

Summary and Conclusions

The purpose of this qualitative study was to fill a gap in the literature by exploring the perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. Throughout the development of the literature review, four themes were explored: alternative grading, authentic learning, self-reflection, and articulation of learning. Alternative grading methods provide a means to assess knowledge acquired without focusing on a test-driven curriculum, with authentic learning environments provide a setting to gauge knowledge acquisition through alternative grading methods like self-reflection and knowledge articulation.

Research has been conducted to explore student self-reflection in authentic learning environments. Some of the studies have supported the idea that student self-reflection is supported in, but not by, authentic learning environments. For example, by providing authentic tasks in authentic contexts, students are required to integrate theory and practice to learn from their personal experiences. Under the guidance of an expert, students integrating theory and practice become familiar with solving real-life situations that may be complex (Cetinkaya, 2018; Merritt, 2019; Percell, 2017; Thibodeaux et al., 2019; Thurab-Nkhosi et al., 2018). In such environments, observer feedback, particularly from the experts or teachers, is provided for the students to modify their actions and improve on their future knowledge (Murillo-Zamorano & Montanero, 2018). Significant research on student self-reflection has been done in higher educational contexts implying little is known regarding other settings, including high school settings (Eather et al., 2019). Regardless of the benefits of self-reflection as an element of authentic learning, no study was found that has tried examining how self-reflection can be improved in the ALE. This research study filled the gap by exploring the perceptions of high school science teachers regarding how alternative grading can support student self-reflection.

Similarly, no research study had been conducted exploring student articulation as one of the elements of authentic learning, which implies that information about articulation among students is speculative. In this regard, the present study was aimed at examining the perceptions of high school science teachers regarding how alternative grading supports student articulation of their learning. The investigation also contributed

data addressing the current knowledge gap associated with a lack of understanding of student articulation in the authentic learning environment.

The lack of qualitative research studies focusing on self-reflection implies that there is a minimal understanding of self-reflection as an essential element of authentic learning. The current research was aimed at applying a qualitative research approach to collect information from primary participants as the sources of information to understand how to improve authentic learning. These concepts and constructs were the foundation for developing the methods used to explore the central phenomenon of this study, high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning. Chapter 3 will describe the methodology of the study and the tools that will be used to collect, and code data acquired.

Chapter 3: Research Method

The purpose of this qualitative interview study was to explore high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning. Through qualitative interviews, I explored the experiences and reflections of educators using alternative grading to support authentic learning. Research studies have demonstrated a positive correlation between using alternative grading and student preparedness for real-world and workforce issues (Key, Czapski, & Ferguson, 2019; Schmidt-Jones, 2017). However, very few researchers have explored the use of alternative grading methods in authentic learning environments (Percell, 2014, 2017). By describing how teachers use alternative grading to support authentic learning, this study expanded on and deepened scholarly understanding of alternative grading measures used in the classroom to elevate student understanding and performance.

In this chapter, I provide details of the research method for this study. First, I describe the research design and rationale. Then, after discussing my role as the researcher for this study, I review the methodology, including procedures for participant selection, instrumentation, recruitment, participation, data collection, and data analysis. After doing so, I discuss issues of trustworthiness and ethical considerations related to this qualitative interview study. I conclude the chapter with a summary of the research method.

Research Design and Rationale

I sought to answer three RQs:

RQ: How do high school science teachers perceive their implementation of alternative grading as a support for authentic learning?

SQ1: What are the perceptions of high school science teachers regarding how alternative grading supports student self-reflection?

SQ2: What are the perceptions of high school science teachers regarding how alternative grading supports student articulation of their learning?

These questions are grounded in three elements derived from Herrington and Oliver's (2000) IDFALE of the conceptual framework. The elements are authentic contexts that reflect the way the knowledge will be used in real life (RQ), promote reflection to enable abstractions to be formed (SQ1), and promote articulation to enable knowledge to be made explicit (SQ2). Deriving the RQs from the constructs in the conceptual framework further strengthened the alignment of the present study. The focus of this study was educators' use of alternative grading to support authentic learning. By highlighting the absence of understanding of high school science teacher perceptions of alternative grading to support authentic learning, I was able to address the gap in the literature.

Research Design and Tradition

To explore high school science teachers' perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning, I used a basic qualitative interview approach. Interviews are often used as a tool for data collection in basic qualitative research design (Patton, 2015; Rubin & Rubin, 2012; Shenton, 2004; Yin, 2016), and they are one of the most common qualitative inquiry methods employed in educational studies (Taylor, Bogdan, &

DeVault, 2016; Yin, 2016). Qualitative interview research studies are unique in that they provide the researcher an opportunity to gain an understanding of an aspect of social life by analyzing the experiences and perspectives of the participants (Creswell, 2013; Patton, 2015; Yin, 2016). A tenet of social constructivism is that humans synthesize meanings; these interpretations can be uncovered via qualitative interview studies (Merriam, 2009; Yin, 2016). The use of a basic qualitative interview research method allowed me to explore the perceptions and experiences of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning.

Consideration for Other Designs

Specialized qualitative research approaches have limitations and guidelines to adhere to fit within the constraints of the design (Patton, 2015; Yin, 2016). In comparison, the basic qualitative interview research approach provides an avenue for the researcher to explore, interpret, and describe the lived experiences of the participants without adhering to such strict constraints (Creswell, 2013; Patton, 2015; Taylor et al., 2016; Yin, 2016). Because alternative grading is a concept that is clearly defined but not often employed in current classrooms (Percell, 2017), an exploratory study was an ideal approach to investigate the design and implementation of these practices to ascertain the perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. I chose to use interviews because I wanted to look at the practical application of alternative grading techniques to support authentic learning through the lived experiences of experts in the

field. Approaches such as phenomenology, narrative, or grounded theory research studies have specifications in the research study design that were not congruent with the present study. For example, in phenomenological studies, researchers explore a phenomenon, not the experiences of individuals utilizing specific skills, while in narrative studies, researchers elicit information on participants' experiences over an extended period of time with consideration for the event and its cultural context (Clandinin & Connelly, 2000; Creswell, 2016). Use of these approaches would have been limiting, and they would not have allowed me to cover the breadth of information that was possible through the use of well-constructed, meaningful interviews.

Role of the Researcher

My role as the researcher was that of an active participant in this study. Through qualitative interviews, I explored the processes and procedures educators use in the field of education (see Rubin & Rubin, 2012). Qualitative research studies are unique in the sense that the role of the researcher serves as a data collection tool (Yin, 2016). Such was the case with my research. As I was the researcher, my job was to collect, transcribe, code, and analyze data.

Researchers must always be aware of their bias (Shenton, 2004), so I took precautions to mitigate bias in the various stages of design for this study. Although I interviewed educators who use the same grading practices that I employ, I was careful not to make assumptions or impart prejudice simply because we use the same methods to grade. I addressed such potential bias by interviewing participants whom I had no prior connection to, journaling before and after each interview, and using debriefing practices

(see Rubin & Rubin, 2012; Shenton, 2004; Yin, 2016). Furthermore, I collaborated with my dissertation committee to create an unbiased interview guide. While I collected data, I maintained a journal before and after each interview to address any bias. Specifically, I wrote down what I felt to be points made to support the RQs, and then I wrote down key findings that may go against what had been discovered in the supportive literature. Journaling helped me to analyze both positive and negative findings and to avoid focusing solely on findings that supported the RQs. During the data analysis phase, I used systematic debriefing techniques to authenticate bias-free findings and provide validity to the study.

Methodology

The following section describes the methodology for my basic qualitative research study using interviews. First, I provide reasoning for participant selections. Then, I describe the instrumentation used to recruit participants, conduct the interviews, and analyze the data that I collected.

Participant Selection Logic

The most commonly used data collection approach in qualitative research is the interview (Gubrium, Holstein, Marvasti, & McKinney, 2012). Qualitative interview studies are unique in that they go beyond basic facts to gather insight into a specific topic by creating an intimate setting where both the participant and researcher seek to discover deep and meaningful information (Gubrium et al., 2012; Guest, Namey, & Mitchell, 2013). Therefore, the logic behind participant selection included a target group of interest, sampling strategy, a criterion for selecting participants, an ideal sample size for

achieving data saturation, and an approach for identifying, contacting, and recruiting participants for the study (Hennink, Kaiser, & Weber, 2019; Mason, 2010).

For this study, the target group of interest consisted of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. From this target group, there were two requirements for participation in this study: teachers in the study needed to use alternative grading techniques, and teachers needed to host classrooms that are representative of authentic learning environments.

The sampling strategy used in this research study was purposeful sampling. Purposeful sampling includes choosing participants for a study based on the purpose of their involvement in the study (Guest et al., 2013). Because the research questions for this study address perceptions and experiences of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning, purposeful sampling was justified, as the target group was sought out based on the purpose of the study. As previously stated, the inclusion criteria followed three requirements: the participants must be high school teachers (with the preference being science educators), must use alternative grading, and must be using authentic learning strategies. Any applicants who did not meet all three of these requirements must be excluded from the study.

In qualitative studies that include interviews, no specific number of participants is appropriate; what is essential is obtaining enough data to reach saturation (Gubrium et al., 2012; Guest, Bunce, & Johnson, 2006; Guest et al., 2013). Saturation does not occur at a

specific number, it occurs when data become repetitive, and no new information can be derived from the interviews (Gubrium et al., 2012; Guest et al., 2006). As a result, purposeful sampling, coupled with nine to twelve, in-depth interviews created a study that had a representative population and had a saturated data set (Patton, 2015; Yin, 2016).

Instrumentation

The primary data collection instrument for qualitative interview research studies is an interview guide. The interview guide contains the interview protocol, interview procedures, and interview questions (Jacob & Furgerson, 2012; Turner, 2010). In addition, a setting for the interviews, visual and audio recording tools, and formal consent for participation in the interview are all functioning forms of the interview guide for the study (Creswell, 2013). For qualitative interview studies, the interview is the sole source of data collection, and data collected through interviews should be used to answer the research questions of the study (Creswell, 2013; Rubin & Rubin, 2012).

The interview guide was modeled after the semi-structured approach to qualitative interviews (Rubin & Rubin, 2012). The interview questions are open to allow for free responses from the participants, and the questions help me to guide the discussion towards obtaining information related to the research questions (Myers & Newman, 2007a). Having open-ended questions allows for the participants to share views and experiences freely. Open discussion without scripted prompts will enable me to be appropriately responsive to participants' comments and experiences. The interview guide opens and closes with a script to ensure consistency in the interview flow.

The development of the interview guide included consultation and direction from educators with advanced degrees in the field of education, including my committee methodologist. They assisted in addressing the following three items: alignment between the research questions and interview questions, implementation of proper form and style of the interview, and development and maintenance of the structure of the interview questions.

Section one of the interview guide includes questions exploring alternative grading in authentic learning environments. These questions were designed based on information from the literature review, which examined assessment variety, grading variety, authentic learning environments, student's real-world workforce skills, and critical thinking in authentic learning environments (Baeten, Dochy, Struyven, Parmentier, & Vanderbruggen, 2016; Brewer & deMarrais, 2015; Cremers et al., 2016; Gozuyesil & Tanriseven, 2017; Koh, 2017; Kosteklioglu & Celen, 2016; Link, 2018; Sharma et al., 2015). The second set of interview questions explore teacher perceptions of the use of student self-reflection activities. The questions were designed to explore information related to reflective practices in the classroom from the student and educators' point of view (Carlson, 2019; Eather, Rileya, Miller, & Imig, 2019; Dignath & Buttner, 2018; Karabulut-Ilgu, Yao, Savolainen, & Jähren, 2018; Larsen, London, & Emke, 2016; Peltola, 2018; Steiner, 2016). The final set of interview questions explored alternative grading and articulation opportunities in the classroom setting. The questions focused on oral and verbal presentations, classroom discussions, and how alternative grading can be applied to these opportunities (Cleveland & Reinsvold, 2017; Cooke et al.,

2017; Hynes & Kwon, 2018; Isnaeni, Wulan, & Solihat, 2017; McDougall & Holden, 2017; Murillo-Zamorano & Montanero, 2018; Nikolic, Stirling, & Ros, 2018; Rajput, 2017; Train & Miyamoto, 2017).

Three individuals with advanced degrees in education assisted in the development of the interview guide to ensure that the interview guide questions addressed the purpose of the study. The methodology, research questions, and interview guide were established through Walden University's Advanced Qualitative Research Methods course.

Throughout the beginnings of the dissertation process, my dissertation committee, which consisted of Dr. Toledo and Dr. Arome, worked with me to ensure the interview questions explored teacher perceptions while maintaining alignment with the research questions. As versions of the interview guide were reviewed and revised, my dissertation committee guided the alignment and direction for managing a qualitative study that was trustworthy and free of bias. With each revision, the dissertation committee guaranteed that the study's content and the qualitative research procedures were adequately established so that the study would be credible, confirmable, transferrable, and dependable.

Procedures for Recruitment, Participation, and Data Collection

After my dissertation committee and Walden University's Institutional Review Board (IRB) approved my study (approval number 11-20-19-0743360), I invited participants to join the study through LinkedIn, Twitter, and via contact with principal's at schools in the Northeastern United States that host authentic learning environments. The invitation included the purpose of the study and the responsibilities of the

participants, including the criteria for inclusion. The prospective participants who agreed to participate in the study were sent the informed consent that, included the inclusion criteria, through email. The participants digitally signed the informed consent by returning an email with the words "I consent." This statement indicated that they acknowledged that they wanted to participate and also met the requirements for participation. Then, an email with timeslots to schedule the interview was sent so that the participants could participate at times convenient to their schedule. To initiate rapport and provide clarity about what the interviews would entail, I sent confirmed participants an email with a copy of the interview guide.

For this study, I conducted a single round of interviews lasting about 30-60 minutes with 11 participants. These interviews were held in an online platform named Zoom. Before and after the interview, I informed the participants that once the interviews were transcribed, a copy would be sent to the participant for verification and validation. Each participant had an email sent to them. As the researcher in this study, I was the sole data collector. I collected the data by conducting and recording the interviews. The recordings were used to address nonverbal responses to the interview questions, and the audio was used for transcription. The recordings were kept in a password-protected desktop computer. No recording was stored on any "cloud" device. The interviews were saved under Participant ID's so that no participant's legal name would be attached to any stored information.

During the data collection and analyzation phase, I used peer debriefing as a method to address credibility. I did that by sending a copy of the transcribed interview to

the participants and my dissertation committee. This debriefing technique (asking the participant to ensure the correct data was collected), and triangulating data by asking the dissertation committee to analyze the transcripts and findings, added to the credibility of the study (Shenton, 2004; Yin, 2016). Through email contact, I asked the interview participants to confirm the findings and authenticate the data collected. Not only did this ensure the credibility of the findings, but this also informed the participants of the level of respect I have for their expertise, opinion, and information.

The interviews were held, recorded, and transcribed. The transcription from each interview was then submitted to my methodologist to ensure that the data collected was meaningful and applicable to the study. Additionally, immediately following the end of the interviews, I journaled my thoughts and feelings about the positive and negative aspects of the interview so that I addressed any influence my bias may have played while conducting the interview. Finally, follow-up questions, sent via email, were used for clarification purposes or to address deeper meanings after participants had had time to reflect on their initial interview (James, 2017). This method of confirming data obtained helped me to reach data saturation. Once saturation was reached, the interview process concluded.

Data Analysis Plan

The interviews were recorded via Zoom. The interviews were then transcribed using Rev.com, an online audio transcription service. Then the transcripts were coded extensively. To ensure that data was adequately represented, both hand-coding and digital coding via the program MAXQDA were conducted. As the coding process progressed, a

code table was created to represent the frequency and importance of words and phrases relayed during interviews. The code table was used to draw comparisons between the new data obtained through the interviews and the information from the literature research presented in Chapter 2 for analysis and synthesis. Four rounds of coding were applied to the data collected. The first and second rounds of coding were completed through the line-by-line method of coding, where I highlighted keywords or phrases that I found to be applicable to the research questions. Then I categorized the codes from those two rounds. Finally, from the categories that were developed through the initial rounds of coding, emergent themes were established. These themes were representative of the conceptual framework that informed the study.

To ensure a successful data analysis plan, the members of my committee provided direct instruction to maintain order and understanding throughout the coding process. Then, through substantial discussion, collaboration, and analysis, the members of my dissertation committee oversaw the interview process, the transcription process, the coding process, and the relay of the findings from this study. The members of my dissertation committee also acted as peer debrief partners, which was a design implemented to ensure the credibility of the study. Finally, conclusions focusing on the research questions were made based on data collected and emergent themes, and those conclusions were reviewed and confirmed through the dissertation committee.

Issues of Trustworthiness

In any qualitative study, trustworthiness, or transparency is of primary concern (Patton, 2015; Shenton, 2004; Yin, 2016). In addition to trustworthiness, qualitative

research studies should also be replicable. Issues of credibility, transferability, dependability, and confirmability should be addressed to ensure that the study is both trustworthy and reliable (Shenton, 2004; Yin, 2016).

According to Yin (2016), credibility in qualitative research can be established through the structure of the interview guide by using prior successful methods to investigate the phenomenon, within comparable studies. With the help of my dissertation committee, the interview guide was modeled after successful, credible studies. This ensured that successful, established research strategies were implemented in this study. Additionally, throughout the process of the development of this study, my committee oversaw the synthesis of the research methods, procedures, and guides; this type of scrutiny ensured the credibility of the research design, as suggested by Shenton (2004).

During the data collection and analyzation phase, I used peer debriefing as a method to address credibility. Through email contact, I asked the interview participants to confirm the findings and authenticate the data collected. Through substantial discussion and analysis, the members of my dissertation committee oversaw the coding, theme development, and production of the results for this study. They also acted as peer debrief partners, thus tackling two more angles of credibility. Additionally, in the development of the participation inclusion material, purposeful sampling was the method that I used to obtain participants. This sampling strategy is a staple in creating a credible study, according to Shenton (2004).

Transferability will be addressed by providing, throughout the methodology section of the dissertation, information regarding the boundaries of the study. Shenton

(2004) describes the many boundaries that can be established in qualitative research. Some examples of the boundaries that confirm transferability include the number of participants, data collection methods, data collection sessions, and the time frame of the study. To address other issues related to transferability, or external validity, my study includes an in-depth description of the background information supporting the study and a detailed description of the participants for the study. With this information, other researchers may use the findings of the study to make generalizations that are meaningful in a research or application setting, as suggested by Shenton (2004).

Both Yin (2016) and Shenton (2004) addressed dependability by explaining that processes within the study should be reported in great detail to ensure that it can be replicated. So, all procedures within the study, the participants, and the interview guide will provide information in great detail. These descriptions will enable a future researcher to conduct the same study, possibly obtaining identical results. Dependability is described as the ability to carry out a replica of the study and achieve similar results (Shenton, 2004). I have addressed dependability via research design, data collection methods, and reflection processes using Merriam and Tisdell (2016), and Shenton (2004). Procedures such as data triangulation (an overlap of credibility), follow-up or clarification of data with participants, journaling, and requesting peer feedback and review from my dissertation committee will also contribute to creating a dependable study (Merriam & Tisdell, 2016; Shenton, 2004; Yin, 2016).

Finally, confirmability, or objectivity, will be addressed through the use of data triangulation via systematic debriefing. My dissertation committee will review my data to

ensure its authenticity. They will also review my data collection journal entries to ensure my work, and the study remains free of bias (Patton, 2015; Shenton, 2004). Since confirmability relates to objectivity or bias (Merriam & Tisdell, 2016; Shenton, 2004), to avoid unnecessary influence related to personal views, I will keep a reflective journal to address times in the study where personal opinion may influence data collected or analyzed. Additionally, Shenton (2004) suggests using an “audit trail” to trace the research steps. By keeping an audit trail of the research process, data collection, and analysis, I can analyze and adjust any piece of work that may be influenced by personal bias.

Ethical Procedures

Ethical procedures are two-fold; they are in place to protect and respect the rights of the participants, and they act as a guide for research integrity (Rubin & Rubin, 2012; Yin, 2016). Walden University has an IRB that sets forth procedures and protocols for studies conducted through the University. I adhered to all of the rules, regulations, and procedures outlined by the IRB. Before making contact with any prospective participant, I obtained IRB approval of my study, including the consent form, interview guide, and data analysis plan. Only after approval from the IRB did I make contact with any of the prospective interviewees.

Once the participants agreed to take part in the study, they signed the approved consent form via email. Before the start of their interview, the participant was provided with a disclaimer reminding them that participation was entirely voluntary. The

disclaimer included a statement referencing their right to withdrawal from the study at any time, for any reason, without penalty.

Data collection was documented via Participant ID to protect participants' identities, and all information was stored under those Participant ID's in files on a password-protected desktop computer. All audio and visual recordings were collected and stored in the same manner. Any information provided in the interviews, which may lead to identifying any participant, was removed from the reported data pool. After the study concluded, all information was transferred to a removable hard drive and stored in a lockbox. The stored data has been set to be destroyed in five years. To further avoid any ethical issues, I looked for participants in the Northeast United States because I work and reside in the Southeast United States. I wanted to prevent snowball sampling and unnecessary influence on participants.

Summary

In Chapter 3, I provided detailed information regarding the methodology for my study. The chapter reviewed the basic qualitative interview research method to be applied to this study focusing on interviews as a data collection tool to explore high school science teacher perceptions of the use of alternative grading, student self-reflection, and student articulation of learning as a support for authentic learning. This chapter included the methodology for the study, the purpose of the study, the research questions, choice of approach to the study, my role as the researcher, how I will select participants, what instrumentation will be used to collect data, the procedures I will follow to collect the data, a data analysis plan, a review of trustworthiness, and ethical procedures.

Chapter 4: Results

The purpose of this qualitative interview study was to explore the perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. To address the purpose of this study, I proposed one primary and two secondary RQs. The RQs were as follows:

RQ: How do high school science teachers perceive their implementation of alternative grading as a support for authentic learning?

SQ1: What are the perceptions of high school science teachers regarding how alternative grading supports student self-reflection?

SQ2: What are the perceptions of high school science teachers regarding how alternative grading supports student articulation of their learning?

In this chapter, I will provide an overview of the nature of this qualitative study and the interpretations of the findings. First, I will describe the setting for the qualitative study and provide demographic information for the study participants. Next, I will describe the data collection and analysis procedures and offer evidence of trustworthiness. I will then present the results of the study in relation to the main RQs. The chapter will conclude with a brief summary of the findings.

Setting

For this qualitative interview study, the participants were high school science teachers using alternative grading in an authentic learning environment. The participants received Participant IDs in the following form: Each was designated *Interviewee* with a number following--for example, *Interviewee 7*. The number order was random and did

not represent any logical sequence. Three individuals who were interviewed were in a school where the headmaster and the employees were writing a book on their brand of education. Due to the investigatory nature of their research on alternative grading, the interviews with the individuals from this school were very focused on the structure of alternative grading and authentic learning. As a result, discussions with these three specific interviewees were heavily influenced by researched pedagogy and practice.

Demographics

In this study I examined the perceptions of high school science teachers regarding their use of alternative grading to support authentic learning. Data collection began with inviting science educators from public and private high schools to participate in the study through social media outlets and via personal invitation. I solicited participants through LinkedIn, Twitter, and via direct contact with institutions where alternative grading techniques were employed. Additionally, upon applying for IRB approval for this study, a choice to post the study invitation on the Walden University Research Participant Pool website was given. Upon approval from the IRB, the invitation to participate was posted through the Walden Research Participant Pool website.

Many of the interviewees were from the Eastern United States. The sample size of interviewees consisted of five male and six female teachers. The collective participant population had teaching experience that ranged from 2 years (novice educator) to 22 years (seasoned educator), with an average teaching experience of 10.9 years. The participating educators also had diverse teaching settings. For example, some educators taught at Title 1 schools while others taught at private schools in affluent neighborhoods.

The participants were of various races, and they were from multiple locations within the United States. The participants' demographics that were relevant to the study are provided in Table 1.

Table 1

Participant Demographics

Participant ID	Years of teaching	Grades taught	Subjects taught
Interviewee 1	20	9-12	Marine biology and oceanography
Interviewee 2	5	9-12	Marine biology and oceanography
Interviewee 3	4	9-12	Biology and environmental studies
Interviewee 4	5	9-12	Biology
Interviewee 5	22	9-12	Physics
Interviewee 6	13	9-12	Chemistry
Interviewee 7	22	9-12	Marine biology and oceanography
Interviewee 8	15	9-12	Biology/General science
Interviewee 9	4	9-12	Marine biology and environmental science
Interviewee 10	6	9-12	Chemistry
Interviewee 11	4	9-12	Biology and experimental science

An interesting finding from this study resulted from analyzing the data collected in the interviews. All but one of the participants were second-career educators. The participants interviewed originally started in another field of work and transitioned to teaching. As a result, many of their teaching and grading practices were derived from experiences or situations they would see in their previous area of work or educational experience (attending college/secondary education). This type of prior experience helped these educators to create authentic learning environments.

Additionally, these participants interviewed were not trained in traditional teaching methods or exposed to grading styles/assessment development other than what they experienced through voluntary professional developments within their districts. Therefore, they were open to explore and use alternative grading styles (narratives vs. percentage vs. GPA/4.0 vs. Pass/Fail), various assessment types (labs, activities, projects, observations, discussions), and multiple grade reporting styles (feedback, open dialogue, percentage). Furthermore, from analyzing their stated comments, the removal of any of these components (being second career educators, not having been exposed to traditional educational programs, being open to grading/assessment styles) would off-set the others, creating an environment that did not represent authentic learning. The participants felt that their particular experiences led to the development of these grading styles and learning environments. An interesting finding from this study resulted from analyzing the data collected in the interviews. All but one of the participants were second-career educators. The participants interviewed originally started in another field of work and transitioned to teaching. As a result, many of their teaching and grading practices were derived from

experiences or situations they would see in their previous area of work or educational experience (attending college/secondary education). This type of prior experience helped these educators to create authentic learning environments.

Data Collection

Eleven science educators were interviewed for this study. Each interview lasted between 30-60 minutes and focused on information relative to the research questions. Each interview followed a pattern and script outlined in the Interview Guide (see Appendix). Each interview was conducted in an online setting and recorded using the web program Zoom. The interviews were scheduled according to the participant's availability, and before the start of the interview and the collection of data, I obtained consent from the participants via email. Interviewee's voices were recorded for transcription purposes, and the participants were notified before the start of the interview.

Each participant understood that sharing their perceptions was voluntary, and I explained that their legal names were not attached to any stored data. When interviews were scheduled, the participant was assigned a participant ID with no identifying information related to the person. Upon completion of the interview, all data related to the participant's information was stored under the created ID. The data that was recorded, such as the Zoom audio file, was then downloaded and stored on a password-protected external hard drive. This audio file was transcribed using the professional transcription services of Rev.com. In the transcription description, the ID was also used. Once the interview and transcription were completed, the audio file uploaded to REV.com and the transcription completed by Rev.com was destroyed from any online storage. The

remaining downloaded audio and transcription were removed from my personal computer and stored on a removable external hard drive that is password protected.

Data Analysis

To analyze the data collected, I utilized popular qualitative analysis methods suggested and developed by Yin (2016) and LaPelle (2004). First, the interviews were conducted, transcribed, and then coded. Next, using LaPelle's (2004) coding table, the data were categorized, analyzed, and sorted based on the overarching research question and the two sub-questions. Then, using Yin's (2016) qualitative data analysis method of compiling, disassembling, and reassembling data from emergent codes, I was able to derive meanings and intentions from the data collected via interviews. To accomplish this task, I listened to the interview audio multiple times so that actual implications were understood and represented. Rubin and Rubin (2012) suggested human interpretation of data as computer programs often fail to represent true meanings of phrases, comments, and responses provided by interviewees. To ensure accuracy of meaning and the removal of bias, as well as to adhere to transcript review, all transcripts were submitted to my methodology chair overseeing the data collection process of this dissertation.

The coding process followed Saldana's (2016) method for coding, which included the initial coding, a second round of coding to develop categories from the codes, and a third round of coding to develop emergent themes from the categorized codes. Coding was done by hand so that I could create tables to place coded keywords and phrases, as opposed to relying on digitized programs to assemble repeated words and phrases simply.

The codebook table created had numbered codes, which assisted in placing each code in a logical sequence that represented emergent themes. When codes were repeated, the line or phrase would be placed in the table according to the number of occurrences. I then began to analyze patterns and describe meanings associated with the phrases in the patterns. The coded documents, phrases, themes, and patterns were then compiled into a sequential document for further analysis based on the research questions. Upon completion, to validate my findings, I entered the coded data into a mapping program named NVivo. This program was able to connect existing patterns in the data and provide new information about the frequency of participant word choice.

Due to the nature of coding, the constant immersion in the data of the interviews allowed me to gain better insight into the meanings of the data, the coding process organized my findings, and the tables helped me to explore the themes provided by the data fully. Table 2 provides an overview of the research questions and themes developed from the coding process.

Table 2

Emergent Themes From Research Questions

Research questions	Emerging themes
RQ: How do high school science teachers perceive their implementation of alternative grading as a support for authentic learning?	Preparation Purpose of Design Objective of the Experience Assessment Variety Grading Style
SQ1: What are the perceptions of high school science teachers regarding how alternative grading supports student self-reflection?	Intent or Goal Application as Reflection or Feedback Outcome Driven
SQ2: What are the perceptions of high school science teachers regarding how alternative grading supports student articulation of their learning?	Implementation Student Improvement Assessment or Grading Approach

As the interviewees went through answering the first set of interview questions focusing on the implementation of alternative grading to support authentic learning, they frequently commented on the implementation of effective assessments to guide student understanding. They also discussed the importance of creating assessments that were representative of authentic learning or a workforce environment. The first set of themes that came from the data focused on the development of an authentic learning experience centered around student development. Words and phrases such as “learners’ level of knowledge,” “aligned content,” “application in the real world,” “different capacities,” and “incorporate learning of multiple levels of cognition and awareness” span the breadth of codes under the themes of preparation, purpose of design, and objective of the experience. The second set of themes for this research question focused on knowledge assessment in the classroom. Words and phrases such as credit for completion,”

“narrative evaluation,” “traditional percentage,” “online interactive activities,” “group projects,” “discussions,” and “observations” make up the codes that developed the emergent themes.

The second set of questions focused on the implementation of student self-reflection activities to support authentic learning. Of the eleven interviews conducted, the most commonly reported use of reflective practices were student self-reflection and teacher-centered critique or narrative evaluation. These statements led to the development of three themes for the second research question, which was Intent or Goal (as they were interconnected in responses), Application as Reflection or Feedback, and Outcome Driven. Words and phrases such as “help me through their thought process,” “promote learning and success,” “work meant to better themselves,” and “move away from self-inflated views,” and “mastery of material” assisted in the development of the emergent theme of Intent or Goal. While codes such as “individualized feedback,” “peer reflection,” “self-reflection,” “peer presentation feedback,” and “teacher-centered feedback,” and “rubric” supported the emergent theme of Application as Reflection or Feedback. Finally, under the emergent theme of Outcome Driven, words and phrases such as “address learning needs,” “students are aware that I am looking at their assignments,” “understanding student’s mental cognition,” “they can reflect on feedback they’re giving,” “develop habits,” “promote honesty,” and “forces an ongoing conversation” were the codes that created the categories that developed the emergent themes for this research question.

The third set of interview questions focused on the articulation of knowledge opportunities in the classroom setting and how the articulation opportunities supported authentic learning environments. The three emergent themes based on this research question were Implementation, Student Improvement, Assessment, or Grading Approach. Codes such as “group projects,” “problem demonstrations,” and “public presentations” made up the categories under the emergent theme of implementation. Codes such as “holistic approach,” “rubric,” and “gamification points” made up the categories under the emergent them of Assessment or Grading Approach. Then finally, codes such as “from shy to engage,” “understand scientific vocabulary/speak eloquently,” and “able to speak with confidence” made up the categories under the emergent theme of Student Improvement.

Based on the codes and the emergent themes from this study, the indication from responses showed that the participants engaged in substantial planning for their courses with an emphasis on instructional design geared towards the development of an authentic learning environment enriched with alternative assessments. These assessments were reported in various forms, such as observations, discussions, modeling, laboratory work, fieldwork, infographics, and oral presentations. Participants also stated that an alternative assessment culminated in reflection, which contributed to the wealth of data provided for the secondary RQs.

Reflection, although not often incorporated into the student’s final grade, was commonly used to gauge understanding and fluency in a topic. Participants stated that they used this approach for various reasons, but often with the intent to perpetuate

knowledge acquisition. This idea of perpetuating knowledge acquisition was also a common sentiment when participants discussed their use of oral presentations and demonstrations to support their authentic learning environment. Overall, the participants provided a variety of data that showcased the development of authentic learning environments laden with alternative assessments that supported the acquisition and application of knowledge in the classroom setting.

Evidence of Trustworthiness

The initial potential challenge reported for the study was that there might be a limited population of science teachers that fit the requirement of the study. These specifications were that participants had to be high school science teachers using alternative assessments in an authentic learning environment. The participants interviewed for this research study fit this category without exception, and therefore, there were no limitations related to the initial potential challenge.

Credibility

To ensure credibility for this study, I adhered to the methods of data collection presented in the methodology section of this dissertation. Employed efforts to ensure credibility included adhering to the interview protocol developed by myself and the methodologist for my study, peer debriefing through email communication, transcript analysis by methodologist, code development oversight by methodologist, and triangulation of data to confirm the analysis. These tactics were employed to confirm consistency in data collection and analysis (James, 2017; Patton, 2015). To increase validity for this study, triangulation and transcript review used, which allowed for

consistency of the data (Patton, 2015). Reviewing and analyzing transcripts, audio recordings, and data collected through coding (an established qualitative research data interpretation tool) helped to ensure credibility and consistency of findings. Additionally, I kept a journal of findings with notes and analysis of data to ensure that bias was minimized.

Transferability

Based on qualitative research methods, to maintain transferability reported findings were drawn from rich data saturated with descriptions and experiences of high school science teachers. Findings from this study were described in detail, and meanings were made implicit through credible and dependable methods in qualitative research design. With this information, other researchers may use the findings of the study to make generalizations that are meaningful in a research or application setting, as suggested by Shenton (2004), ensuring the promotion of replicable results for similar studies in future research is paramount. As stated earlier in Chapter 3, to maintain transferability in the study, I have reported on the numbers of organizations taking part in the study and where they are based. I have stated the restrictions on the type of people who contributed data (the limitations for participant), and I provided a brief description of the participants teaching experience. The data charts above also state the number of participants involved in the research. Data collection methods were expressly conveyed, the number of interviews was stated, and the length of each interview was reported. Additionally, I relayed the time period over which the data was collected (Shenton, 2004). To address other issues related to transferability, or external validity, my study

also included an in-depth description of the background information supporting the study, which was presented in Chapter 2.

Dependability

To maintain dependability, comprehensive records detailing how data was collected, when data was collected (time and dates), how data was stored, how data was transcribed, how data was managed and kept. These reporting procedures were put in place to ensure that other researchers could replicate the study and obtain similar results (Shenton, 2004). Consistency in conducting research helps to solidify dependable qualitative research studies, and it ensures the trustworthiness of the study. Procedures such as data triangulation (an overlap of credibility), follow-up and email clarification with participants, self-journaling to eliminate bias, and requesting peer feedback and review from my dissertation committee also contributed to creating a dependable study (Merriam & Tisdell, 2016; Shenton, 2004; Yin, 2016).

Confirmability

To ensure confirmability, I journaled following each interview. The journaling was done to assist in minimizing bias. While interviewing participants, the interviews were recorded and transcribed verbatim to ensure accuracy. No summarizing or note-taking was done so that the data was completely accurate and authentic. The transcripts were reviewed by my committee chair to ensure validity. To confirm my understanding of data provided in the interviews, upon completion, I sent transcript review emails. These emails had summaries included that relayed to the participant what I understood from their comments, remarks, and experiences. The interviewees reviewed these emails

and responded in agreeance to my comments, or they responded by clarifying their statements. Review of their transcripts provided the participants a way to verify the accuracy of the collected data. Based on Shenton's (2004) suggestion in maintaining confirmability in a study, I used an audit trail to document the research steps. By collecting data through interviews, having my methodologist check my transcripts and findings, and through transcript review emails to ensure that data was interpreted properly, I triangulated data. Triangulating data helped to minimize the influence of personal bias on the study.

Results

This section has been formatted to present the findings in a logical sequence based on the research questions. Following the individual interviews, the participant's answers to the interview questions were organized by the responses to the questions. Then through coding, patterns emerged, and categories and themes were developed based on the patterns. Those emergent themes and the codes and categories by which they were developed are reported below.

Research Question

The main research question for the study explored how high school science teachers perceive their implementation of alternative grading as a support for authentic learning. Five themes emerged from the analysis of participants' experiences: preparation, the purpose of design, the objective of the experience, assessment variety, and grading style.

Preparation. The eleven high school science teachers that were interviewed discussed the significance of preparation in developing assessments that support authentic learning. Many of the participants explained the extensive planning it takes to create an authentic learning environment and assess the learning within. For example, the cluster of instructional models used by the group of participants included The ADDIE Model, the Multifaceted Learning Style of Education, VARK, The 5E Model, Webb's Depth of Knowledge, Bloom's Taxonomy, Kinesthetic approach, and the Incorporate learning Model for multiple levels of cognition and awareness.

Under the theme of preparation, a commonly stated application in creating an authentic learning environment came from teacher planning procedures. For the development of the learning environment that supported both authentic learning and the use of alternative assessments, Interviewee 1 stated:

Typically, when I design a new course, I use the ADDIE instructional design approach. In this model, I analyze any instructional problems and objectives, then identify the learning environment that will be used and the level of knowledge that the student will already have. In the design and development phases, I start to construct assessments and activities that both fit the objectives and the learner's needs. In the implementation phase, I ensure that learners have the necessary skills to complete the assigned activities and evaluate the overall design of the course. In the evaluation stage, I use some assessments to evaluate student's levels of learning.

While Interviewee 2 stated that through planning, he created a blend of experience and academic study to help them [students] understand the topic, nothing more was addressed in terms of planning. However, when Interviewee 11 discussed planning for the alternative assessments utilized in the authentic classroom, the participant stated:

I use the ideas of Bloom's Taxonomy and climbing a learning ladder to try to formulate my lesson plans. I will scaffold lessons and build upon previously taught material. The students learn, then they use their hands to explore, then we find a way to make them create and teach others, either through projects or presentations. Learn to teach others.

Interviewee 4 also used a variety of instructional models to create an authentic learning environment in her classroom. Her reasoning behind utilizing various instructional models was to gauge understanding and comprehension and apply the best information delivery method for the classroom.

Interviewee 6 was enthusiastic in confirming the use of authentic classroom rich with alternative assessments and said:

Lesson planning for me involves the Backward Design it approaches lesson planning in the exact opposite of traditional lesson planning. In Backward Design, the teacher first thinks of the most important objectives that need to be taught in the lesson, then figures out what assessment is best to measure those objectives, and then develops activities that are most appropriate to reach those objectives. Lesson planning in Backward Design involves me doing the following I decide

the lesson objectives (Identify desired results). Then I decide on how to assess the students on the lesson (Determine acceptable evidence), and finally, I decide the lesson instruction the students should do (Plan learning experiences and instruction). As a science teacher the Backward Design is effective. I have used this process now for at least 5 years because Backward Design ensure that the lesson's objectives, assessment, and instruction are all aligned.

In discussing planning, Interviewee 3 commented on the focus of the planning as opposed to the structure of the planning period by stating:

The planning is sort of moving us through the progression of the content, but also trying to weave in current event topics that are related to the content, and also give the students time to work on their individual projects in the form of short research projects.

This was also a common sentiment for Interviewee 5 as the participant said:

What ideas came up today, and what needs to be continued, explained further, deepened. And then thinking about okay, how can I create... a lot of the times I would love to, because it's a physics class, the stuff should be demonstrated and touched and held, and so I do a lot of demonstrations. So I spend a lot of my time in my planning thinking about what demonstrations best communicate the ideas and how the kids can participate in that demonstration, or if I can turn it into a little mini lab activity, how I can have the kids actually physically... break them into groups, physically interacting with the equipment so that they come to understand what principles are being communicated. Are being investigated.

Often in education, creating novel experiences and accurately assessing those experiences proves to be challenging for some educators. This is also limited due to the testing nature of the current educational culture. All participants sought to actively create engaging educational environments rich in day-to-day assessments geared towards pushing students to understand and interact with learned material.

Purpose of design. The second emergent theme under the first research question is the purpose of design. The participants were often concerned with creating real-world, work-force type experiences in the classroom. However, more than the concern for creating this environment was polishing a skillset that would be used in these environments. Their responses focused heavily on that sentiment. For example, Interviewee 9 stated:

Gamification at a deeper level can be used to prepare students for the competitive nature of college and most professional fields. It can be used when applied to specific scenarios to prepare students to help each other but at the same time make sure their own work exceeds expectations in order to gain their own individual benefits. This is the perfect training for real life work experiences which require them to work in groups in a sociable and functional manner but also to shine through the rest of their team to show off their skills in order to advance in their field.

Additionally, Interviewee 9 stated:

In the publish or die field of science I use gamification in order to teach valuable interpersonal skills that will allow my students to build connections to peers in

their field but also have the competitive edge to advance. The reward system of gamification is very similar to the professional field which rewards high level social skills combined with high level work. By doing things like turning scientific poster building into a competition in which the top posters get printed, it forces students to help and rely on each other for their specific strengths while still competing to have the best project. While a student may be brilliant in chemistry, they may not be the best graphic designers or lack the technology skills. The competition forces them to rely on each other to strengthen their weaknesses creating strong social skills that include an exchange of benefits. While they help a student, who struggles with the technical knowledge they gain aid in the design phase of the project. At the end of the day the students are still competing against each other for that prestige, but they are aware of the social exchanges that are needed to gain the prize.

Participants also reported on creating activities with the combination of sharpening a skillset while simultaneously building a knowledge base. Participants said that they wanted to create engaging opportunities where knowledge was deepening while skills were developing. For example, Interviewee 10 stated:

So even though the students are taking higher level courses following this [authentic learning] approach because its gives students a more condensed way to take notes and a method of application of the material they just learned. They have to create, and structure items based on what they've learned or interacted

with. It makes them use both spheres of their brain and it gives them an opportunity to talk to other students while working.

Interviewee 5's contribution to the same topic was the following:

You talk about authentic learning, and the thing that, any physics principles are so fundamental that they don't really come up in day-to-day activities in people's lives, but they are fundamental to how the world actually works. So, revealing them through the kids actually seeing things happen in front of them, not just me standing up at a chalkboard and explaining stuff, but actually, I've built a piece of equipment. I challenge them with an idea like, "Well what do you think will happen when I roll this marble down this little device, and will it do this? Will it do that? What's your theory?" So I get them to try to state what they think will happen. This is for demonstrations. I get them to talk about it with each other, and then I show them, and we investigate what the implications are of what they see.

Interviewee 2 also stated:

I guess one of the things that we try not to do is just have them memorize things, and having them really synthesize what they're learning and apply it, I guess I would say would show, I guess, the strongest evidence for authentic learning, as opposed to, I guess ... On tests, yes, being able to show like certain skills and being able to memorize certain steps is important because if you can't do those basic things, it's going to be very hard for the student to apply it to like, say, a project, chemical engineering project, but yeah, I guess so.

Interviewee 11 spoke about the method by which she helps the students to build the skill set they need. She also commented on the satisfaction for the educator when they are able to watch this skill development turn into an interest in education. Simply,

Interviewee 11 stated:

I find that science, and in particular biology is always building up on itself. I like using the idea of scaffolding my lessons so that my students see this progress and continue to explore different directions for the lesson. It's satisfying to know they are interested in more avenues of learning.

Purposefully designing work with the intent to develop a wholly trained science student seemed to be a driving force for the implementation of many activities in these participants' classrooms. The participants often discussed the need to create competent and successful students inside and outside of their class, equipped to manage real-world, work-force situations.

Objective of the experience. The objective of the experience is an emergent theme developed from categories focused on the result of the implementation of an activity. Each participant focused heavily on wanting students to have a takeaway from an activity or an a-ha moment from a lesson. For example, Interviewee 3 stated:

Oftentimes I would start a class by addressing sort of a theme that showed up in the homework, to try to clarify any misconceptions and whatnot. And then usually that comes in the form of a warmup to the class, and then we sort of progress from there to the next ... throughout through the program.

Interviewee 5 furthered the idea that a student should understand, by highlighting that understanding is only the beginning and questioning paramount. Interviewee 5 stated:

Now I usually, when I'm planning demonstrations in, or hands-on activities, I try to pick things where the result is not at all obvious, and in fact usually where it's going to challenge misconceptions. My best demonstrations, I'll ask the kids what they think is going to happen and they'll all say something really dramatically incorrect. And then when they see what does actually happen, then they're wide open to really learning because they've just seen that they were wrong. And the thing to do there is not to say, "You were wrong," of course, but to say, "Wow, what a misperception here that almost everyone has. How is this actually so different, what's the real world doing rather than what you think it's doing?" So planning my physics class is a lot about thinking about, what's the next idea and how do I get the kids to see it in a real demonstration? So, I spend a lot of time building equipment and taking equipment apart. And reviewing my notes on the topics to make sure that I didn't give some opposite demonstration last year that would be even better than what I'm thinking of now.

With the same sentiment, Interviewee 2 stated:

In oceanography, we have a science fair project that they have to ... I think it's a really good example of them applying what they've learned doing their own research. It is like very inquiry-based, I think as you mentioned earlier, where they pick their own question that they want to answer and they have to design their own project in order to answer that question or get more information on it,

and then they have to analyze their results. I think that's a really good way for them to articulate what they know. Chemistry, kind of similar things. A lot of the projects are really enlightening about how they kind of synthesize that knowledge and apply it. I think a lot of ... Informally, like day to day, when we discuss in class, they have to ... Well, I'll ask them, "Okay, let's review. Can someone explain this idea to me?" They'll have to do things like that.

The study participants were hyper-focused on the students understanding the concepts being taught. As a result, they intentionally designed experiences in the classroom where misconceptions would be verbalized. For example, through partners work, where the student needed to express their understanding while being observed. They considered monitoring the interactions, observing misconceptions, identifying issues in understanding, and clarifying those issues through discussion to be an alternative assessment. For example, Interviewee 10 stated:

Since alternative assessments are always informal and continuously happening in class, I could say I implement many different items. I listen when they work, correct misconceptions, engage in dialogue, engage in discussions, provide labs, have them work through foldable notebooks, etc. To be more specific, I use an inquiry-based presentation in my AS environmental management class as an alternative assessment. For example, in order to study how different countries, manage air pollution students pick which countries they want to study and research and present their findings to the class with the other students take notes

of their presentation. Also, I have students repair or fix their test after they take it so they can see what they got wrong.

Interviewee 11 stated:

In Biology, our prescribed hands on labs have the students perform some types of experiments by following the scientific method. It's applied to the concept we are covering. During the lab the students are graded on their behavior and ability to complete the assignment and the questions that they answered on the lab.

Throughout the lab I can observe their understanding through their discussions with each other. If I hear anything out of the ordinary or out of line with what we learned I may say "so why do you think that" or "what lead you to that conclusion?" This is a great time to catch misconceptions.

Overall, the participants in this study had clear ideas of a structure to create opportunities in class where they could assess learning, misconceptions, and further understanding of the material.

Assessment variety. Assessment variety became an emergent theme as the participants began to dive into the various assessment strategies they used in their classrooms. Despite the variety of assessments, the result was always the same: perpetuate knowledge through application and evaluation. For example, Interviewee 4 stated:

I use real world workforce "anecdotes" in my classroom. For example, I relate the experience of a physician to that of a scientist, to help students understand an approach to the scientific method/process in the form of diagnoses. I ask student,

“What would an engineer do?” or ask students if they are familiar with job title of a topic that we are studying for example, when we study plants, most students understand that a Botanist is a scientist that studies plants.

Interviewee 7 explained:

So, you know, we have the type of inquiry investigation type problem that needs to be investigated or examined, and we asked them to discuss amongst themselves how they might come up with a solution, or the answer. And it gives us time to go ahead and work in groups, because that's where a lot of the real learning occurs. And after a while, we're just trying to use different approaches that people have. There isn't a no one right or wrong answer to answer all the types of questions. More importantly, but the methodology, of what they actually do here, they ask the right questions, or they ask the questions that is interactive.

Interviewee 8 expressed the following:

Questioning for understanding and group presentations. Although, truly, anything can be an alternative to actual grading. Any time I hear the students speak I am grading, listening, gauging information being exchanged. If I hear an issue, I immediately jump on it and correct it. I evaluate student knowledge through verbal communication. When students need to present, in addition to the scientific information, they are also assessed on other skills such as clear and understandable speech, making eye contact with audience, appropriately dressed, etc. Anything that would be important to a scientific community, group of peers, etc. Is important in the assessment. They need to understand that everything they

do is evaluated when they provide information to other, whether it be in my class, at their home, in their jobs, etc.

Interviewee 9 relayed that:

The most common type of alternative assessment I implement has to be a kinesthetic approach to assessment where instead of answering questions they have to apply the knowledge of the topic in order to build some kind of model that connects complex chemical theory at a more observable level. This type of assessment lends itself very well to chemistry due to all the different levels of understanding a student can have on a specific topic and the need for visual representations for topics that cannot normally be seen. Visualization has always been a key skill in chemistry and due to this building models from prior knowledge is an excellent way to gauge understanding.

Another example laden with variety comes from Interviewee 3 with the following explanation:

Well, ultimately in our midterm assessment and the year-end assessment, all the testing and quantitative data we get about a student's performance in math all gets sort of packaged into one narrative evaluation of the student's work. And so, there you can get to talk a lot about effort, attitude, leadership, but also talk about skills that they still need to work on. A variety of different things, to help sort of paint a picture of all the student's work, so that it doesn't get reduced to an A or a B or a C with a couple sentences. A quite lengthy, page-long narrative on the student's work in the class. every Wednesday we have field work to do in [the Northeast

United States]. We also do work in the [Northeast United States]. And so that work is getting ... that's their lab period, so their lab is in the field, and their science fair projects are designed around questions that come out of that work. The [school] schedule is tough to manage, so I've sort of become the master of the hundred-minute field trip. So, we can get to a site, do our data collection, and get back in time for either lunch or their next period. So, it's quite a packed time period, but we do it every Wednesday. Students look forward to it, and for me it's nice to get ... obviously I want to get them out doing the work and interacting outside of [school], as their next step is outside of [school] in college.

Similarly, Interviewee 5 added:

And then of course I have labs which I have the kids do which are more full-on versions of my demonstrations, but where the kids get to do investigating themselves. Now some people... this is the tricky one because I think a lot of people have ideas about labs but in physics labs, they appear to be open-ended. But I think high school students rarely need help to get to the essential ideas, and so I have them do a lot of open-ended analysis, but I don't have them do a lot of open-ended construction of the equipment itself. I really think it's my job to make sure that as many... that the stuff is clearly set up properly, that there are no extraneous effects that are coming in that are masking the fundamental ideas. I don't like the idea that open-ended means that the teacher doesn't guide the process towards really investigating the ideas that are under consideration. A lot of the kids I've had in these classes, they're going to go on and take engineering

and physics classes in college and I want them to be ready and really have a strong grasp of the fundamentals.

Despite the variety, each example the participants provided offered evidence that the participants actively engaged in creating experiences that were meaningful and kinesthetic, or carried out through the process of learning as opposed to the process of development.

Grading style. Grading style became an emergent theme due to the nature of the educational field. All but one participant got into teaching as a secondary career. As a result, ten of the eleven participants did not graduate from a traditional undergraduate teaching program. Although they were able to attend professional developments focused on grading methods and styles, mostly, their grading style was created through experience in the classroom.

In reference to grading style, Interviewee 8 stated:

I still follow rubrics for these types of assessments, but it is more like using “plus, check, minus” or “ESU.” I like to use rubrics because it gives me a variety of items to look at, however, it’s still within the confines of a box. I want the students to go above and beyond, so I try to have a lot of categories that are open to development for each presentation. I can quickly mark a “+” if a student shows the skill or has mastered the concept. Then I have a variety of shorthand symbols to show either or not the student has mastered, gone beyond, said something unique or exceptional, etc.

An example of using grading for more than mastery of content was presented by

Interviewee 11:

I have a two-part grade. One of the grades is for their behavior and a the other is more traditional. For the second one I read and edit their answers. The alternative portion, I guess would be the editing of their answers.

Regarding activities in the classroom, Interviewee 10 stated:

I typically use a rubric that outlines the requirements of the project and how creativity, content, and grammar are handled. But I also listen and correct or readdress questions to see if students can maneuver the topic in various ways.

To clarify her understanding of assessments and provide that clarification for transcription in the interview, Interviewee 6 first explained formal and informal assessment and then her style of grading.

Traditional instruction is structured around Formal assessments which include tests, quizzes, and projects. Students can study and prepare for these assessments in advance, and they provide a systematic tool for teachers to measure a student's knowledge. The Informal assessments are less structure and are more casual, observation-based tools alternative grading methods. These types of assessments involve little advance preparation and no there is no need to grade the results, these assessments allow teachers to get a feel for student progress and identify areas in which they might need more instruction. Informal assessments can help teachers pinpoint students' strengths and weaknesses and guide planning for upcoming lessons. I personally will affirm that informal assessments are

important because they can help identify potential problem areas and allow for course correction before students are required to demonstrate understanding at a formal evaluation.

Three of the 11 participants had unique assessments specific to their institution. Their institution operates without a grading scheme, similar to a Pass/Fail system. In the classroom, they all still assess and examine students similarly to their counterparts in traditional schools. However, those educators are required to create extensive narratives of the student's understanding and progress in class. The narratives are all-encompassing and cover the students' progress holistically. The narratives are an in-depth account of items such as student skills, depth of knowledge, interactions with others, work in the field. For example, Interviewee 2 explained:

We don't do any of those averages, or it's not very numerically based at all. It's all based on a kind of narrative evaluation of the students. We like to think that we kind of take a more holistic approach. We talk about maybe more about the skills that the student has, what they've learned, how they've demonstrated that, as well as their weaknesses. Then we give them credit, or no credit based on that. I don't know if anyone else has talked to you about this, but we also have this designation. Besides credit, they can also earn what's known as like an honors, credit with honors, that designation. It's supposedly to reward students who have put in extra effort, really shown a passion for the material, that sort of thing. It's really hard to compare, but it's somewhat similar to if you have like, say, like an honors class in a public school, like that sort of idea. In practicality, it seems, at

least in [school], that it's sort of been like a pseudo grade, I would say, whereas honors is kind of like the A plus that everyone shoots for. Some students that are maybe more really trying to think about polishing up their college applications, maybe try to take a class for honors even if they're not really that passionate about it or if they're not really, I don't know, I would say like genuinely engaged in the class.

Interviewee 5 reported:

So, the narrative evaluation which is the official record of the class is the assessment. I will write down things like, "Okay, this is how they did on the problem sets but they tended to struggle with unit analysis," and, "Their explanations were really, really good," or "They did the numerical calculations really well but they had a hard time putting their understanding into words." And then the next paragraph will be, "In labs they're very helpful to each other." I'll just make up a name like, "Clara really made sure that everybody in her group understands what the purpose of the lab is and she's really good at helping them with the equipment." Or maybe Clara doesn't listen well to her lab partners. Or when we have a full class meeting, I'll say whether the kid asks questions or not, or do they participate strongly in the little discussion questions that I ask. All of that gets equal billing in the evaluation, and their average on problem sets was 80 sets. So, I just talk about the whole thing, all the things that they do in the class. I talk about how they work with each other, how they talk in class. How well they analyze data. And then how well they solve mathematical-based problems, but

then how well do they explain it in words. And to me all of those are the course, so I assess all of them and talk about all of them. So, their narrative evaluations at the end of the semester tend to be half to three-quarters of a single-spaced typed page. It's a lot of work to write them.

All participants reported designing learning, activities, and assessments with the intent to support or create an authentic learning experiment. While some participants were more comfortable with tabulating and grading informally, others felt the need to keep track in a very detailed narrative of progress or success. Also, while grading style varied widely in institutions, between teachers, and even in the same classroom with the same teacher, the goal for grading remained the same; assess the student for knowledge acquired. With almost every participant, when asked about grading, the sentiment was that there was always an attempt to award students for their display of knowledge. Acknowledging, outwardly, that they are, indeed, progressing towards an understanding of the information.

Subquestion 1

For the first research sub-question, I examined the perceptions of high school science teachers regarding how alternative grading supports student self-reflection. Participants who used reflection, whether it be student self-reflection, peer-reflection, or observations of student progress by the teachers, stated that their implementation of reflection in an authentic learning environment provided positive experiences for the students within the class. However, the majority of the participants in this study used reflection sparingly. As a result, there were only three emergent themes from the data

collected. The emergent themes for research question two are Intent/Goal, Application as Reflection or Feedback, and Outcome.

Intent or goal. While investigating the use of student self-reflection and peer-reflection in this research study, categories focused on feedback supported the emergent theme of Intent/Goal. Throughout the planning and implementation of an authentic learning environment that utilized alternative grading, participants stated that they designed assessments with the learning and mastery as an intent for an overall goal of knowledge acquisition. For example, Interviewee 1 stated:

The self-reflections are used so students can express what they have learned and how they understand the topics we have covered. This reflection helps me to know where the student stands in terms of their understanding of the materials covered in class. The infographic assignment allows students to be creative while also expressing what they learned on a topic. The online interactive activities vary course to course but are conducted on a VLE.

For Interviewee 3, the intent shifted more towards knowledge of the self and self-awareness within mastery of content. Interviewee 3 reflected:

Periodically, I have a self-evaluation where the student ... The questions are simple. What do you do well? What do you think you need to work on? And they are quite honest with me and themselves about what they're doing, and why they're doing it, and how well they're doing. Some students have sort of a little more self-inflated view of what they can do and what they know, and I think that kind of helps feed into the narrative of evaluation that we do periodically

throughout the year of the students. Because their self-reflection, my ongoing conversation with them, and the narrative at the end ... to me it means that all along the way the students really know where they stand within the class, so that at the end of say a semester there's no surprises as to what I say in the narrative, and there's no disconnect between what I think and what they think.

For Interviewee 4, mastery of content was supreme, and she coupled self-reflection activities with mastery of content concerns as well. Interviewee 4 expressed the following:

The only incidences in which I have asked students to reflect on their assessment, was if they did not perform to mastery. For projects, I would ask a student, based on the rubric, what grade would they assign themselves. They may pick up on the fact that they did not score well in certain areas such as creativity and accuracy. I will then prompt them and ask, "What would you differently if you could?" and then I will allow the student to re-submit until they reach mastery.

There were also instances where participants used self-reflection as a discussion tool to develop interpersonal relationships in the class, or to promote self-awareness in the classroom setting. For example, Interviewee 9 added:

Implementation of student reflection during times of alternative grading in my class was mainly done in a very informal manner. Discussion during alternative assignments served the purpose of student reflection.

Student self-reflection is an alternative assessment in the classroom setting, and it is often employed to help students increase awareness and understanding so that they can

apply it to their learning. The study participants who utilized reflection activities in this way noted gains in understanding, as described above.

Application as reflection or feedback. Throughout the interviews, it was noted that there was not a clear understanding of reflective practices. Participants often used reflection interchangeably with feedback. Both approaches focus on examining the self. However, one is student-led, and the other is teacher-led. In either case, the use of reflective processes always had an intended goal of perpetuating knowledge. For example, Interviewee 1 stated:

I use both peer and self-reflections. I use peer reflections when students work in groups to promote feedback from each group member. I also use self-reflection on group assignments and other various assignments so I can gain a better insight into each student's mental cognition about the project and their progress.

Two examples of feedback being used interchangeably with reflection are provided below where Interviewee 2 shared:

Well, I guess not grading them, not so much as a grade for each other, but one of the things when we have projects, we do presentations and I often have students fill out sort of like a form or like some feedback to give the presenters so then they know, okay, this worked out well, here's how you can like improve. Well, for the oceanography class, when we do our project presentations, I do break them into groups and have them proofread their papers and I give them a rubric that they can kind of like grade each other in a sense, but not that accounts for anything, but just to give them feedback.

Interviewee 7 declared:

In every inquiry-based problem or any advanced math problem that I assess, when we finish, I would let them go and write down the things they did well or learn well or seem to master and also the things they need more work on. They would get their tests back obviously with the problems and they would go "I didn't understand this" then They would write down on a separate sheet the type of problem it is and another section where they talked about the problem portions that they understand. Each person would do it individually and then they would come up and show me their form. Then we would go over their test. I'd go over their test one on one. Then I'd further guide them to success, explaining how to get to the right solution or how to use the right steps.

However, Interviewee 8 provided insight on the application of reflection as feedback for group member in an inquiry-based project. Interviewee 8 stated:

The students completed a video review of a nutrient cycle and were supposed to write a reflection at the end on what they understood about the topic and if it was helpful in learning the cycle. They also could provide information to me about their group members participation.

Interviewee 9 provided an example of the application of reflection as a student self-reflection piece below where he stated:

The student reflection was implemented by using questioning during alternative assignments in the classroom. This can take the form of everything from the discussion of a particular part of the student projects during their planning phase

of the assignment. These leads to a discussion where the student must go back and reflect on different points of their knowledge and apply it to the project to make sure it meets the standards. These happens in all kinds of activities in the classroom, during lab activities discussion questions are given as I go from table to table and ask the students probing questions that will make them think critically of what they are doing and why. These are reflected in the write ups of the students where they must answer similar reflection questions about the connections between what they did and what they learned. Reflection questions are a big part of my teaching style and even come in during my lectures, it is my belief that if a student isn't thinking and reflecting on what they are being taught, then they are not learning.

Even though the study participants referred to self-reflection, reflection, and feedback interchangeably, they all provided descriptions of using a method that asked the students to draw from within and evaluate themselves or others.

Outcome driven. The final theme that emerged from this research question focused on reflective practices in the authentic learning environment was Outcome. The participants focused heavily on what they wanted the students to gain from reflective practices and how they wanted their educational setting to surround the idea of self-improvement and critique. For example, Interviewee 2 explained:

I know as much as we write these things to them, we can't force them to like do anything about it, like implementing the suggestions. I mean, there are definitely students who after they've gotten their midterm comments or like the end of the

semester comments have really changed their habits. Sometimes we give them very like practical things like I would like to meet with you like once a week, like that sort of thing, or they should ... You say like, "Oh, like you need to pay more attention in your ... " I might write like, "Oh, you should be more careful in your lab," or something or whatever. Some of the students do it, but I guess as teenagers are, sometimes the advice that you give them just goes in one ear and out the other, but yeah.

In discussing the reasoning behind the importance of the outcome of the reflective practice, Interviewee 7 noted that peer influence and critique may provide an avenue for students to listen and adjust:

In some cases, the peers' comments might be more endeared or meaningful to them. They're used to always having the teachers always criticize them and tell them what's wrong. For overall reflection, it's a part of the honors class. It's a requirement. I would tell them they get additional bonus points added on to their score for completing the reflection.

One participant shared that she felt that the implementation of reflection may only be an incentive to do well as opposed to learn more, which is the sentiment in the following example where Interviewee 8 reflected:

I think some students value the feedback, and others only care about the grade. Many students are only seeking why they got a lower grade, not how they could improve. It is often a concern for the teacher that the students don't understand

the materials, whereas for the students they don't understand why they didn't get an A for mediocre work.

All participants reported designing reflections with the intent of promoting critical self-reflection and the acquisition of knowledge. While some participants observed students actively reflecting on learning and witnessed successful reflection activities, others found it challenging to implement reflection with success.

Subquestion 2

In the second research sub-question, I focused on the perceptions of high school science teachers regarding how alternative grading supports student articulation of their learning. Throughout the interview and coding process, the ideas of promoting speech, verbalization of acquired knowledge, and opportunities to express what students have learned were common. At the final step of the coding process, the emergent themes of Implementation, Improvement, and Assessment Application were established.

Implementation. The emergent theme implementation refers to the participant's ability to implement articulation of knowledge opportunities in the classroom setting. Articulation of knowledge refers to the student's ability to demonstrate understanding of a particular concept orally. There were a variety of ways in which articulation of knowledge opportunities were implemented. Some study participants provided accounts of extensive projects, and others offered simple, effective opportunities. For example, Interviewee 1, Interviewee 6, and Interviewee 11 all had simple and expertly planned articulation of knowledge opportunities. Interviewee 1 stated:

I try to do this in a variety of ways, including using group projects, virtual learning environments, etc. I like students to be actively engaged in my courses;

Interviewee 6 stated:

Oral presentation and student demonstration are implemented articulation of knowledge opportunities;

and Interviewee 11 said:

I have the students answer a lot of questions throughout my lessons. These discussions open up an opportunity for the students to communicate and explain what they know in student-friendly language.

Three participants focused on large projects that included various audience types for the application of articulation of knowledge opportunities. For example, Interviewee 2 stated:

Well, I mean, at least in the oceanography class, I'd like to think that we have a hand in the like increasing their presentation skills, their communication skills. One of the things that we do work on is, because we have a science fair at the end of the year, they have to really understand what they've ... be able to understand the science, but then also be able to articulate that to people who might not have any background. We have other teachers from other departments, students, because our school goes from 6th to 12th grade. They might have a sixth-grade student come up and ask them about like, "Oh, what is this? What does that mean? Why did you do this?" or whatever. They need to be able to explain it. We do some practice. What else? Early in the year, we attended a conference that was

sponsored by Mass Audubon Society and a bunch of other schools in the area, both public and private schools presented their projects on the salt marsh that's in [the Northeast United States]. They were able to see other presentations. We kind of debriefed it and things that were good, things that might be improved on, things that they might want to incorporate, or things that they might want to try to like keep in mind not to fall into that kind of like trap, I guess, themselves.

For the second discipline that Interviewee 2 taught he presented another large scale, content specific project. He stated:

Yeah, one of the things actually that I do a lot of, especially in chemistry, is a lot of group work, where they might have to solve some problems together or try to solve a problem with a small group of students, maybe like in pairs or maybe, well, maximum like four students at max. One of the things that I really enjoy seeing and I think I see a lot of in my class is them teaching each other. When they can teach each other and share their ideas and solve the problem and work it out, I think that shows a good understanding. The other thing that's, I think, not unique about our school but is a good opportunity is we often have a lot of visitors who might be like parents or prospective parents or prospective students who are visiting our school. They'll be paired with a host, a student, who they'll shadow throughout the day. A lot of times, they have to explain what's going on to that guest. That also shows that they can articulate the knowledge, that they understand what's going on in the class. I think it is pretty authentic, I would say.

Focusing on large projects with presentations focusing on many audiences, Interviewee 3's experiences and projects were similar to Interviewee 2's information. In relation to articulation opportunities in the classroom, Interviewee 3 explained the following:

Science, we have a lot of ... on Wednesday we're having poster presentations of their many research projects that they've been doing this fall, which is based on the data pretty much collected in [the Northeast United States]. This is kind of an effort to give them a little practice in the scientific method with a very limited data set, that hopefully will become sort of pilot studies for a greater project that's due at the end of the second semester. So, they're putting a full-on formal poster presentation of their work, and they'll be presenting on Wednesday, so the hope is that they'll be able to articulate their work in a public setting like that. We do that public presentation both in [the Northeast United States] and at [school].

Interviewee 4 had a similar response where he stated:

At the end of the year, students must present individual presentations on a topic/benchmark. I believe that the ability to independently present is a true assessment of knowledge and competency, and while difficult, most students feel good once they presented and some are even excited to do so. It is the only time of the year in which I do not utilize group work/projects. This is truly an opportunity for students to articulate their ideas, creativity, and content knowledge.

Interviewee's 8, 9, 10, and 11, utilized articulation of knowledge opportunities most often after direct instruction through heavy, in depth discussions. The examples provided through the interviews follow below.

Interviewee 7 stated:

Yes, we always try to when going over a new topic or create a new topic. We always try to verbalize what's going on in order to try to make it more concrete because some people can't process simply...they don't really interpret concepts or steps as easily. So, we always try to make them say it rather than write quietly and continue to make mistakes or misconceptions. After that people work on the steps in the solution together. That function gives us an output for peer discussion and verbalization.

When asked about offering articulation opportunities in the classroom, Interviewee 8 shared how he implements articulation opportunities. The information is provided below.

Yes, throughout a unit, I have direct questioning, at least one project, then a review and formal assessment. I am a heavy lecturer but throughout lecture I stop and ask questions. I make eye contact and seek out students who might be shy to answer. I also look to students who need validation and answer more willingly. That opens the floor up to discussion among the students which I can oversee and interject in if needed.

In relation to the end product of the articulation opportunities provided in class, Interviewee 9 stated:

Students who struggle at explaining their thoughts in science courses leave articulation abilities with a better grasp at how to verbally explain complex thought processes in the sciences. Through articulation activities that involve mirroring and coaching, the students can mirror verbal examples on how these articulations should sound like. Once the mirroring step is mastered, they can easily make the jump to placing their own thoughts into a coherent oral explanation and gain the valuable skill to express their thoughts to others.

Interviewee 10 focused on how articulation opportunities are provided throughout the course. She was specific about how she implemented articulation and gamification in the classroom. She added:

In the classroom during and after direct instruction students are asked questions for points. I have a Harry Potter House cup style system where the students are divided into teams and they get points for answering questions showing that they have mastered the content. It's a competitive in class game and it makes the students excited to learn or answer questions. This helps them to verbalize information and then others can chime in and correct or contribute to the discussion.

The use of verbal communication is an integral part of authentic learning and often employed as a method of assessment of knowledge. This type of activity was the most comfortable for all of the participants to report about. Examples were extensive and provided rich accounts of the use of articulation to support the acquisition of various layers of knowledge.

Student improvement. Each opportunity to demonstrate knowledge in a classroom setting became an assessment. Practice presentations, discussions, live presentations, and student-led demonstrations all provided avenues for the teacher to assess an initial understanding of how students grasped the material and how they improved from one discussion, project, or presentation to the next. Within the emergent theme of improvement, participants recounted incidences where their students excelled. For example, Interviewee 1 stated:

Many students improved in their ability to adequately describe what they learned. In the beginning, it was just restating what I said or the textbook, by the end of the course, the self-reflections were more of the student's thoughts and opinions. They seem to be able to better put their thoughts into not only sentences but also into actions. By actions, I mean when we have group discussions in class.

This was also the case for Interviewee 6 who shared:

Students are presently working on a campaign to promote conservation of resource. This project involves students actively initiating a movement to promote a cause to not only their school community but local state and internationally. The students had to create a slogan, poster, display boards and have had to prepare presentations to educate younger children and their peers. Such a project is a year-based event that requires students to build to their skills sets. Many students are having an opportunity to shine and excel with such a project. I have had an opportunity to witness many students who normally would shy away from class work come alive and perform successfully.

Interviewee 8 echoed the sentiment of Interviewee's 1 and 6 when she explained:

I believe the students are much better oral communicators by the end of the year. They need practice and clear expectations. They become comfortable with the teaching and learning environment and are more expressive and outgoing by the end of the year, hence, more willing to speak openly and communicate knowledge. Essentially, they know more and are better able to intelligently communicate what they know.

Interviewees 9, 10, and 11 focused on improvements in scientific vocabulary, words, and phrases. The accounts of the improvements follow below. Interviewee 9 stated:

A student I had for three years and went through Honors, AS and A level chemistry came in his sophomore year with a very high IQ level but lacking at all the ability to explain his thought process. He would constantly use words like thing and stuff but on examinations that were purely material based and multiple choice he would score far above average. Through coaching during laboratory assignments and lectures he slowly started to gain the vocabulary and verbal skills to explain what went through his head. Once in AICE courses, where the need scores on the assessment very much revolves around explanations, he was forced to take this even further. By asking questions during labs and prompting him to change his response style when it was unclear, he slowly developed the ability to formulate complex explanations. By the time he reached A level chemistry which does not even have a multiple-choice component to the exam, this student is now able to very clearly articulate his thought process which allows him to express to

others his high level of intelligent. Basically, through years of this coaching he is not only smart now he sounds smart as well.

With the idea of improvement at the forefront of the conversation, Interviewee 10 stated:

At the beginning the students struggle to articulate their answers with the correct vocabulary they need for the reader to understand their answer and award them points, by the end of the year the students are well versed in the scientific terminology they need to portray the mastery of knowledge.

Again, focusing on improvement, Interviewee 11 added:

I feel as though they improve a lot, but I feel like this is not only from my class. The students obviously get a better vocabulary. They show improvement overall throughout. They mature and become better students and better learners. I show them a lot of the prefix and suffix for science that can be applied in every class, and they take those skills into those classes. It's really wonderful to see.

Interviewee 4 recounted the student's ability to understand political issues related to scientific and workplace issues and noted that as an improvement in cognition and awareness. Interviewee 4 declared:

My freshman students are required to know the advantages and disadvantages of CRISPR technology and its applications in bioinformatics and genetics. When we have our class debate, I poll my students to determine if their opinion on a topic changed after viewing each debate. The gain is measured based on whether there was a change, not the stance. I ask student to share why their opinion changed and what made them change it. The topics for the debate are randomly assigned so

student may have to argue in favor of a stance that they are against, and through the research process, they may find that they agree with the “pro” side. For example, many of my students were in favor of employers requesting employee genetic information, but after the debate, many believed that it was wrong to do so because of the insurance and discrimination that might result as a result of the genetic information being shared.

In trying to rationalize how the improvement is visualized, Interviewee 7 commented that:

The application problem is where they have to relate actual knowledge and try to use that to translate what is being made in words from numbers and processes. You know how your struggling learners drastically improve over time. We're not looking at a dramatic change. But usually it's gradual amongst everybody. I guess it's more evident in the lower level.

Communication is a skill used in almost every aspect of human interaction, whether the interaction is verbal, non-verbal, visual, or non-visual. Every educator here promotes communication by constructing opportunities for their students to improve on those skills that would be required in the real-world, work-force setting.

Assessment and grading approach. This emergent theme came from codes and categories where the participants described their approach to grading, grading assessments, and creating assessments. Their personalized approach to grading came from experience, and it was applied based on their view of what was important in the articulation of knowledge opportunity. Grading was described simply as all-

encompassing, or holistic, or it was defined based on the instrument used to assess the student. Very simply put, Interviewee 1 stated:

I use these [opportunities] for some type of grade. I do believe that this grade is holistic. She was discussing the articulation grades associated with presentation, for example, eye contact, the use of “um” and “OK.” She may grade that portion of it or use those notations for a discussion on real-world work-force expectations.

Similar to Interviewee 1, Interviewee 4 stated:

Some aspects of the rubric are holistic, such as effort and creativity but the area of accuracy and organization, must reflect certain standards in order to earn points that translate into a letter grade.

Interviewee 6 utilized these opportunities in a two-fold way where she gathered information about the students’ progress, without being forced to determine a final grade, and she used what she heard to create lessons centered around misconceptions. For example, Interviewee 6 stated:

These assessments allow me to get a feel for student progress and identify areas in which they might need more instruction. Informal assessments assist me in pinpoint students’ strengths and weaknesses and guide planning for upcoming lessons. I am a holistic teacher.

The same can be said for Interviewee 9 and 11 where Interviewee 9 stated:

I do not directly use these opportunities as grades, instead I grade their abilities to put those thoughts and words on paper in the same manner they do in person.

While the articulation opportunities are used to build the ability to put thoughts

together, the classical assessments are a measurable grading opportunity for them to put the exact same wording they use during articulation on a more permanent medium.

Interviewee 11 stated: Other than mentally tallying understanding and participation, I do not grade these opportunities.

Interviewee 8 expressed the limitations of rubrics and why she utilizes holistic grading when she stated:

It's a holistic grading approach. The direct questioning and projects are many times assessed with alternative grading. I use rubrics or marking schemes that look at specific words or phrases that need to be said to know that students understand. The rubrics are difficult because I want the students to go beyond reciting and into understanding, so it's harder to just check off on rubrics.

Interviewee 7 mostly focused on observation and inclusion as opposed to deliberate grading. Interviewee 7 stated:

I'll probably walk around to the different groups and probably listen in on them. Keeping a record, I'd take note if they're going through the drill that way or simply tuning out. Each one basically tries to teach the other person and the rest of the group. We try to balance it out and make sure everyone has had a chance to do it. They do the final project and presentation for the entire class. They will either set up a power point or Prezi and each person in the group can talk.

Interviewee 10 provided an incentive to the articulation activities that coupled with the gamification authentic learning environment within the classroom. She said:

The Harry Potter style game in the classroom earns them points, and the team at the end of the quarter that has the most points gets 15 points in their assessment's category. This is coveted! They truly want the assessment assistance because the tests are very rigorous and their weight in the grade book is tantamount.

Study participants saw that their use of assessment approach gave them the freedom to assign grades, provide opportunities for improvement, and create environments reminiscent of real-world, work-force settings. Their methods encouraged participation, knowledge acquisition, and understanding of the material through active dialogue.

Discrepant Cases

Discrepant cases were few. But the discrepant cases highlighted a gap in practice. For any discrepancies noted, there was either an issue with the participants' comfort level in applying the alternative grading technique, or there was a complete removal of the grading technique in question. The information below outlines the discrepancies.

Subquestion 1: Discrepancy in Reflection. To note a discrepancy, Interviewee 6 used reflection sparingly in the classroom setting. Reported usage was minimal but consistent with investigating mastery of content. The participant said she used reflection only in cases where she wanted to students to reflect in critical thinking.

Another noted discrepancy came from Interviewee 10's data. In direct contrast to the statement above, Interviewee 10 did not see using reflection as a means to help students master content. Interviewee 10's statement regarding the use of reflection is noted below:

I think that I rarely use student reflection because we are more focused on mastering the content and moving on to the next topic. I also have very little experience using reflection or knowing how to incorporate it. Although I am not a teacher by trade, like I did not go to school to be an educator, I am a teacher by choice. So, I wasn't given formal training on a lot of alternative assessment style education techniques outside of the Cambridge training that I choose to do myself which provided insight into the lack of training for transition teachers utilizing alternative grading techniques in the classroom.

Subquestion 2: Discrepancy in Articulation of Knowledge. A discrepancy noted in Interviewee 5's data, comes from the participant's recollection of an unsuccessful attempted articulation opportunity. As described below, when teaching a math problem that was integrated in the science curriculum, he started out with students discussing ways in which they would solve the problem. He then coupled the discussion with a writing activity which took away from the opportunity to articulate knowledge. Below is the account of what Interviewee 5 stated:

One thing that I notice with my physics students is that at first for a lot of kids the math obscures the narrative idea of what's happening. And then as they come forward as physics students, they come to see that the math actually articulates the idea. It's not just a way of... but that doesn't mean that you'll be devoid of narrative content. You get extra narrative content and it comes to you that to interpret the equations themselves as having narrative being. And that's a skill that I ask for all the time. That is every single problem section. It's not just a

calculation, it's why what happens, happens. And so I have them do a lot of writing about that, but then I don't assess their ability to verbally do it in class consciously, although I do end up talking about it in their evaluation like, "So-and-so articulates their ideas very clearly." But I don't really have progress in my mind at that... maybe I should. It'd be just one more thing to try to keep track of.

Summary

An investigation into the perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and articulation of knowledge was conducted. Through a basic qualitative study, 11 participants were interviewed regarding their perceptions of the use of alternative grading to support authentic learning, student self-reflection, and student articulation of knowledge. To maintain a trustworthy study, steps to maintain credibility, transferability, dependability, and confirmability were described as they applied to the research. Findings were broken down by individual research questions.

RQ focused on the use of alternative grading to support authentic learning. The data collected indicated five emergent themes from the interview protocol questions: preparation, purpose of design, objective of the experience, assessment variety, and grading style. These themes provided evidence the alternative grading was an essential component in both the development of assessments and the creation of an authentic learning environment.

SQ1 focused on the perceptions of high school science teachers using alternative grading to support student self-reflection. The data collected indicated three emergent

themes from the interview protocol questions: intent or goal, application as reflection or feedback, and outcome driven. These themes were consistent in findings that, when applied, student self-reflection was a critical component in the development and maintenance of an authentic learning environment. Alternative grading measures such as correcting misconceptions through discussions and addressing student self-awareness became common in the authentic learning environment utilizing student self-reflection.

SQ2 focused on the perceptions of high school science teachers using alternative grading to support student articulation of knowledge. The data collected indicated three emergent themes from the interview protocol questions: implementation, student improvement, and assessment approach. Through the development of articulation opportunities and the use of alternative grading such as rubrics, feedback, and peer-reflection or critique, educators were able to promote student success while maintaining an authentic learning environment.

An additional finding outside of the research questions were that in listening, reviewing, and clarifying information from the data, what emerged was the idea that these environments were made successful due to the nature of the instructor. All but one of the participants interviewed were second-career educators. Their understanding of the workforce environment provided them the skills to develop activities that would be seen in these environments. This also assisted in their grading style, where they were able to manage student understanding through avenues not related to numerical test or quiz data.

Based on the data obtained through the interviews, and the results presented here, in Chapter 5 I will provide the interpretation of the findings from Chapter 4, the

limitations of the study, the recommendation for future studies based on the data obtained, and the implication for the findings where the results of the study could positively affect social change.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this qualitative interview study was to explore the perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. I conducted the study to address the gap in the literature regarding high school science teacher perceptions of alternative grading to support authentic learning. The key findings from the study indicate that educator participants used structured models in education to create authentic, meaningful educational experiences for students. Participants also incorporated peer and self-reflection in the learning environment to address the real-world application of constructive criticism and inward reflection and to prepare students for the real-world workforce, participants often incorporated articulation of knowledge opportunities. These articulation opportunities provided the students with an experience where they were able to mimic real-world scientific presentations through their coursework. The results provide the platform for the interpretation of the findings.

Interpretation of the Findings

Herrington and Oliver's (2000) IDFALE was the conceptual framework that governed this study. From the constructs in the IDFALE model, I developed three RQs to explore through individual interviews with science educators. Although this conceptual framework is made up of nine constructs, only three were chosen to examine teacher perceptions of their use of alternative grading to support authentic learning, the use of self-reflection, and student articulation of knowledge. The three constructs used were provide authentic contexts that reflect the way knowledge will be used in real-life (1),

promote reflection to enable abstractions to be formed (6), and promote articulation to enable tacit knowledge to be made explicit (7) (Herrington & Oliver, 2000, p. 4). The findings were broken down based on the RQs and the themes that emerged through the interviews. The findings are organized based on the concepts presented in the literature review in Chapter 2.

Alternative Grading

According to Herrington and Oliver's (2000) IDFALE, a key component in the development of an authentic learning environment is the embedding of authentic assessments of learning within the created tasks in the learning environment. Doing so results in an obligation for the educator to develop meaningful, applicable tasks that incorporate alternative grading techniques in a variety of ways to support authentic learning environments. Examples of these forms of engagement activities that the participants reported using were student self-reflection assignments, infographic assignments, online interactive activities and labs, group projects, activities to propose solutions to real-world sustainability issues, experiments, "build it themselves" independent research activities, fieldwork with partner educational institutions, take-home problem sets, science fair projects, in-class discussion, observations, inquiry-based presentations, interactive notebooks with foldables, interactive games, case studies, gamification in the classroom, exploratory questions, poster projects, brochure creations, and oral presentations. The participants indicated their effectiveness in utilizing these engagement activities as alternative grading opportunities.

These activities were not only used for the students to manipulate the information they learned, but they were also used by the participants as evidence of alternative grading techniques. In the established literature, these activities would be considered alternative assessments to be scored on a scale (4.0/percentage; see CITE). That was not the case in this study. The educators used the activities to gain an understanding of the student's ability in the classroom. Instead of a number grade, the infographic would be stored and used for comparison as the student progressed in the classroom. The reliance on a grade to determine success after the fact was not evident in these teachers' practices. They had real-time discussions and addressed issues in the classroom by using alternative grading techniques.

The results of my research supported the idea that alternative grading and alternative assessment are critical components of creating authentic learning environments (Gozuyesil & Tanriseven, 2017). The results also supported the idea that alternative grading and alternative assessment are saturated with real-world, workforce-type learning opportunities (Koh, 2017). The concepts of alternative grading and alternative assessments were analyzed here to provide information that the melding of authentic learning and alternative grading/assessment provides successful educational experiences. Many participants stated that provided these successful educational experiences by creating activities, laboratory work, or field experiments that were representative of lab work and fieldwork in the areas of science that the participant was originally employed. For example, Interviewee 1, a former marine scientist, took his marine science class out for field trips to collect marine samples or analyze substrate.

Then, he had the student population present their findings to the city. This embodiment of the real-world workforce went so far as to emulate scientific discovery and presentation before a city council.

My findings also extend the knowledge by addressing suggested research avenues. For example, Koh (2017) discussed the importance of creating real-world workforce learning to prepare students, which the participants in my study also expressed. The participants in my research shared how the development of authentic learning environments rich with alternative grading and alternative assessment opportunities assisted in preparing the students for their pending real-world workforce experiences. All learning activities were developed using established educational pedagogy, but the grading techniques (or lack of grading) was novel. The participants created experiences and teaching opportunities by eliminating the pressure or stress of a percentage or scale denoting failure or success.

Research focusing on the complete removal of traditional grades in the classroom setting is limited to Percell (2014) and Schinske and Tanner (2014). Although Percell (2014) and Schinske and Tanner (2014) report of environments free of the traditional grading system, the success of students in environments free of traditional grades is not studied in depth. In this study, three participants provided data rich with stories of success of students who have been educated in an environment free of traditional grades. While this data is limited to three accounts of the lived experiences of teachers teaching in an authentic learning environment free of grades, it is documented data showing successful learning environments free of the traditional grading systems used in the United States.

Additionally, Gozuyesil and Tanriseven (2017) discussed, in detail, alternative grading methods, but they did not report on the benefits of the grading technique concerning student success. My study provided examples of the success that some educators experienced when implementing alternative grading, which extends the knowledge already present in the field by providing evidence supporting alternative grading techniques.

Interviewees expressed that the use of various grading styles, such as observations, discussions, reflection activities, articulation opportunities, and all-encompassing narratives, are essential supports for the development of critical thinking and problem-solving skills in the classroom. The participants discussed, in detail, how they designed the observations, discussions, and activities in a way that would push students to consider why things were occurring, not just provide an analysis of what was happening. These study findings align with Kinay and Bagceci's (2016) results showing that alternative grading in authentic learning environments helps to increase problem-solving skills. The findings from my study also extend the knowledge to explain the reasoning and depth of understanding of the learning environment that the educator is creating.

The study participants also shared that they used both self-reflective practices and articulation opportunities to make students comfortable with obtaining real-world workforce skills. Several participants stated that they used student self-reflection and articulation opportunities as a means to test acquired knowledge, knowledge connection strength, and the students' understanding of concepts. This particular finding extends the

information produced by Kolomuc's (2017) study, which indicated that, although science educators expressed a desire to utilize alternative grading techniques in the classroom, they often did not. In the findings of this study, not only did the teachers reveal that they used alternative grading, but they also said that they felt that the alternative grading positively benefited the students. Collectively, the understanding was that the alternative grading opportunities provided ways to address misconceptions informally so that the students felt comfortable with the information, the activity, and the implication of the engagement.

Alternative Grading Through the Removal of Grades

A novel grading system was also discovered through these interviews. The three participants that worked in an environment free of a grading scale reported that they planned, taught, and assessed in ways that were in support of authentic learning environments. They maintained an extensive narrative on student strengths, weaknesses, and personal progress. These reports were then processed as complete narratives of achievement when students move on to higher education.

In Chapter 2, I reported that several researchers suggested that alternative grading methods, coupled with authentic learning environments, may support the development of real-world, workforce skills (Cetinkaya, 2018; Merritt, 2019; Percell, 2017; Schmidt-Jones, 2017). The findings of my research study provided evidence that confirmed that authentic learning environments, coupled with alternative grading techniques, do support the development of real-world workforce skills. But, as stated in the background section of this dissertation, there was virtually no peer-reviewed information in educational

journals focusing on the complete removal of a grading scheme in the classroom setting. There was also no data regarding how the removal of a grading scheme affects students' development of real-world, workforce skills. Thus, my study extended knowledge in the field of education by providing information about the experiences of educators creating authentic learning environments free of traditional grading schemes.

Data gained from the experiences of these educators who did not use traditional grading schemes provide new information in the field of education. Novel data emerged in this study regarding the perceptions of educators creating authentic learning environments without the use of a traditional grading scale. As reported in Chapter 2, Percell (2017) reported heavily on the context of grades in authentic learning environments and suggested the need for studies investigating the effect of grading on various aspects of the educational process. The results of my study provided information that extends this type of research and an avenue for others to investigate.

Authentic Learning

Throughout the interviews, the questions concerning the development of the learning environment showed less emphasis placed on the creation of an authentic learning environment and more of an emphasis placed on learning. The participants stated that they used various instructional models to create learning environments, but none of the models are expressly designed for authentic learning environments. An interesting finding was that almost every educator spoke of the importance of preparing students with skillsets and knowledge that would be required in the real-world situations they would participate in when they entered the workforce.

The participants stated that to achieve the goal of creating an authentic learning environment, they needed to develop lessons, activities, labs, and learning experiences that would include various alternative grading opportunities reminiscent of the workforce setting evaluations. Activities of this nature were created so that the students would be fully immersed in the learning and be exposed to procedures they may encounter in the real-world workforce setting. These statements support the Ghosh et al. 's (2017) findings that the tools used to create alternative grading opportunities support authentic learning environments. This study extends the knowledge Ghosh et al. 's (2017) study presented by providing additional information into the nature of the creation of authentic learning environments through the scope of activities designed, the assessments strategies suggested, and the educator's interpretation of the success of alternative grading techniques within the learning environment.

Alternative Grading and Authentic Learning

The finding related to second-career educators provided insight into the development of alternative assessments. The study participants provided data that explained their assessment development processes, which clarified why their assessments were tailored and meaningful. This knowledge also helped me to understand their perceptions of alternative grading and their willingness to use more than summative assessments to gauge learning in the classroom.

Most interviewees stated that they were unaware that their methods were considered alternative, or that their grading styles were viewed as an alternative, which provided a finding unique to alternative grading and authentic learning. Due to the nature

of the second-career status of the participants, they were able to create learning environments representative of their fieldwork that they were previously employed in. Since the study participants were science educators, most of their previous work experience was in the science field. Having experience in the field of science means that they were able to tailor experiences, lab work, and fieldwork to mimic that of real-world workforce settings. For example, a marine science educator creating experiences he lived during his time on a research vessel collecting samples for review and investigation. Because these educators were so familiar with what would be expected of new employees in their respective fields, they were better able to prepare students for a workforce representative authentic learning environment.

This finding is interesting because, if we look at the research conducted by Demir et al. (2018), they stated that teachers do not implement alternative grading techniques due to lack of training. In this study, the teacher applied various forms of alternative grading in the classroom setting, even though they did not earn their teaching certificate from standard education programs that include preparation for the classroom environment. The data from the interviews also suggested that the use of alternative grading techniques helped students to develop the necessary real-world workforce skills that Basri, Purwanto, As'ari, and Sisworo (2019), Harjo et al. (2019), and Schmidt-Jones (2017) suggested were missing in the student population.

Kolomuc (2017) found that teachers often did not implement alternative grading techniques due to the pressures associated with the testing culture. However, the findings of my study suggested that teachers were less concerned with testing and more concerned

with the acquisition of knowledge and skills. Participants referred to what would be seen by scientists in their respective fields. For example, laboratory skills, data interpretation skills, etc. Rarely did they mention an end of course exam or high stakes test. This data suggests that these second-career teachers are focused on the development of adequate workforce individuals as opposed to developing test-takers.

Self-Reflection

The second research question focused on alternative grading to support self-reflection. The most significant implication from the interviewee responses indicated that there was an overall lack of implementation of meaningful reflective practices in the classroom, similar to the findings of Kolomuc (2017) and Demir et al. (2018). Participants did not feel comfortable with implementing reflective activities, they confused reflection with feedback, and they indicated they did not have enough time to integrate student self-reflection into their practices. However, the participants did find that oral feedback or verbal critiques were a highly effective alternative grading tool used in the reflection classroom. Participants were comfortable with oral reflective practices, but they were not comfortable with written reflection. These findings, coupled with the knowledge that the participants were not trained in formal education programs, led to the assumption that the study participants may not implement self-reflection activities because they had not have developed the tools to implement alternative assessments, including self-reflection properly.

For the participants that expressed that they correctly implemented reflective practices in their classroom, they felt that, as Dignath and Buttner (2018) stated, their

students were better able to reflect on their learning. However, information gained here extends that knowledge. In the findings, I noted that there were two types of responses, participants who used reflection as feedback, and participants who used student self-reflection to encourage students to reflect on their learning journey. Participants interviewed who fell into the latter category, stated that their students were able to reflect on their learning abilities. These study participants reported that, by encouraging students to reflect on their learning, a fruitful dialogue between the participants and the students was established. Participants said that the dialogue focused on the students, the progress in their educational journey, and the student's ability to foster critical thinking skills. The development of this dialogue helped to establish significant interpersonal relationships between the participants and the students, which, in turn, created a healthy environment reflective of a supportive workforce environment.

Articulation of Learning

The final research question focused on alternative grading to support articulation of learning. The participants were more confident in utilizing articulation opportunities in the classroom than they were using reflection opportunities in the classroom. These findings relate to the study conducted by Isnaeni et al., (2017), who suggested an investigation into the coupling of articulation opportunities with performance assessment strategies. The participants for this study provided a multitude of opportunities for students to articulate what they had learned. The present study addresses articulation and performance assessment through project presentations, fieldwork presentations for major scientific sites within their school districts, and through projects where the rest of the

school and the school district were invited to come and participate, the students were provided with opportunities to present to multiple audiences. The study participants explained that through these opportunities, the students were able to explain science concepts to a wide range of ages, so they had to learn how to speak to children and adults alike. The participants explained that the more the students taught science concepts, the better they understood what they had learned.

The alternative grading opportunities associated with projects also supported Murillo-Zamorano and Montanero's (2018) findings that were reported in Chapter 2, where reflection was coupled with the articulation activities. Several participants stated that they would have other students' critique or give feedback to help improve the presentation. Other participants commented that they had the students reflect on their project work as an accountability measure for group members, which is reminiscent of the real-world workforce environment. Finally, the participants were able to use rubrics and grading measures to provide meaningful data to students about their performance and connection to the material being presented.

As I reported in Chapter 2, McDougall and Holden (2017) stated that research focused on oral presentations and articulation skills were limited in college-level students. Although published research on oral presentation skills and articulation opportunities may be limited, the results of my study showed that they were incorporating both approaches/activities/opportunities in their authentic learning environments. The incorporation of both means that the participants revealed that they maximize the effectiveness of articulation opportunities so that their students either become successful

at presenting (developing real-world skillsets) or more familiar with the information being taught.

Summary of the Interpretation

Overall, the findings and implications align with the conceptual framework for the study by providing the context and guidelines for the development of authentic learning. Through the research questions, the perceptions of educators using alternative grading in the authentic learning environment were explored. I discovered that alternative grading is used by all of the educators in the study in various ways. The participants stated that they primarily used alternative grading to gauge learning and understanding in the authentic learning environment without having to assign a formal letter grade. Although, in some cases, they assigned grades for activities for they were using alternative grading. I also found that educators used student self-reflection sparingly. They used feedback as a replacement for reflection, and they often couple articulation activities with reflection. Finally, I discovered that the participants liked using articulation opportunities in authentic learning environments and that they usually coupled the articulation activities with alternative grading to provide critique and feedback for improvement on future projects.

Limitations of the Study

The initial limitations documented for the study were recruiting science teachers that used alternative grading in authentic learning environments. Based on those guidelines, limitations related to recruitment were not an issue for this study. However, within the participant pool, three individuals from a specific school volunteered to

participate in the study. They know each other and may have influenced one another to participate. That fact may have unintentionally caused a case of snowball sampling.

For this study, data were collected via interviews. Interviews are personal accounts of the lived experiences of the participants. The relaying of information in an interview setting acts as a limitation in the study (Price & Murnan, 2004). The reasoning behind the interview being viewed as a limitation related to the fact that I was unable to observe participants' behaviors and I was reliant on their experience and perceptions as an account of their teaching practices (Yin, 2016). The interview was also a snapshot of the experiences of educators. A one-time 30-60-minute interview inherently causes a limitation in data as I cannot observe behaviors, classroom environments, or lived experiences.

Time was restricted to the participant's availability, and often, the participant would participate after a full day of work. This may have influenced their recollection of experiences or willingness to share information. However, after the interview was completed, transcribed, and reviewed by my methodologist, I then had to summarize the data and send a transcript review email within four weeks. The four-week reporting delay period also provided time for the participants to reflect on the interview experience. If they felt they did not accurately relay accounts during the interview, the email exchange provided an opportunity to communicate and correct any misconceptions.

Qualitative research is also discrepant in the sense that it is not representative of a whole, but rather a fraction of a targeted group. Data is collected from such a small population that is could not possibly be statistically representative of the entire population

of educators using alternative grading in authentic learning environments (Price & Murnan, 2004). Therefore, the scope of my study is limited by the population size.

Additionally, virtually no peer-reviewed data exists that focuses on the complete removal of a grading scheme from the educational setting. There is a heavy amount of data focusing on alternatives to grading, alternative grading, and alternative assessments. However, I had to interpret and relay data from the three individuals I interviewed who worked for a school that completely removed the grading scheme. Although their methods of assessment were based on authentic learning practices, I was limited in peer-reviewed research focusing on the removal of grades in the educational setting.

Recommendations

Upon analysis of the literature on authentic learning environments, alternative grading, self-reflection, and articulation of knowledge, the following four recommendations for future research are being proposed an investigation into the practices of assessment in schools without grading schemes to examine the implications of student success related to the removal of a grading scheme, an investigation into the teaching methods and grading techniques of career change teachers or second-career educators to explore how this specific type of career change impacts the educational community, an investigation to explore the reasoning behind the resistance to implement student self-reflection should be conducted, and an investigation into teaching programs and assessment strategies should be conducted to explore the possibility that teacher training programs are not going into depth regarding alternative grading techniques. The rationale for exploring these research topics is presented below.

The findings from this study provided evidence that schools devoid of grading schemes exist. Although limited, their teaching styles and methods should be explored to provide information on the variety of grading techniques used in the educational community. An investigation into the practices of assessment in schools without grading schemes should be conducted to examine the implications of student success related to the removal of a grading scheme. Also, in this study, many participants interviewed were second-career teachers who created authentic learning environments in their classrooms that mimicked the real-world workforce setting. An investigation into the teaching methods and grading techniques of career change teachers or second-career educators should be conducted to explore how this specific type of career change impacts the educational community.

Findings also indicated that self-reflection was a problematic alternative grading technique to implement in the classroom. An investigation to explore the reasoning behind the resistance to implement student self-reflection should be conducted. Finally, there is a possibility that teacher training programs may not be exploring alternative grading techniques and alternative assessment methods. A lack of education in alternative assessment creation or grading without the use of a percentage or scale may be the reasoning behind the lack of implementation of alternative grading techniques in the classroom. An investigation into teaching programs and assessment strategies should be conducted to explore this possibility.

Implications

The findings of this study indicated that alternative grading encompassed a variety of techniques that can be implemented in an authentic learning environment to

support knowledge acquisition and instruction. Alternative grading can also be used to support student self-reflection and student articulation of knowledge opportunities when implemented in an authentic learning environment. Findings also indicated that teachers utilizing these methods of instruction were second-career educators who did not participate in an educational training program.

Walden University values positive social change and encourages each student to be mindful of impacting positive social change when they are completing their studies. With that sentiment as a guiding framework, this study was designed to address a gap in the literature and focus on the positive social change that may be enacted from the results. The findings of this study can contribute to positive social change by suggesting that school districts can provide teacher training programs focused on assessment quality, techniques, and the creation of authentic learning environments in the field of science.

To implement social change, the consideration of a budget to create training programs or professional development opportunities should be considered. These programs can focus on alternative grading techniques, the implementation of authentic learning environments coupled with alternative grading techniques, and environments rich with critical self-reflection and articulation of knowledge opportunities. Throughout the nation, educational spending and budgets are limited. However, to encourage new and innovative individuals to join the field of education, courses like this should be offered. Consideration for new training programs focused on authentic learning and the development of alternative grading strategies may assist new teachers in the field to navigate the development of their teaching style. The program may also assist second-

career teachers in understanding various assessment strategies they did not learn in their primary degree program.

Conclusion

Educators use alternative grading techniques to promote knowledge acquisition and understanding of the authentic learning environment. Their classrooms encourage the use of alternative grading through the application of various activities involving the implementation of a skillset fashioned for a real-world workforce setting. There were two ways that alternative grading applied in their classroom settings. The first was through the complete removal of the traditional grading system. Three of the participants in this study work in an environment where the removal of a grading scheme has led to the development of an all-encompassing narrative as an overview of the student progress. The student's narrative provides the school with an overview of the student's strengths and weaknesses in the academic setting. The second application of alternative grading came in the form of constant formative assessment in the classroom. Educators creating authentic learning environments in their classroom found every opportunity to engage the students in the learning experience, to correct any misconceptions in their learning, and to push students to develop skillsets that would be required in the real-world, workforce setting.

In this study, alternative grading appeared not to limit instruction in any way. It was a natural progression in the classroom setting, where the instructor continuously critiqued and refined the learned information in the mind of the student. With those findings now available, an investigation into incorporating alternative grading and

assessment into the curriculum should be explored so that new and seasoned educators can have an opportunity to integrate alternative grading into their practice. Additionally, an investigation into the removal of a traditional grading scheme could be explored to examine the impact of the removal of grades combined with alternative grading techniques on the success of student learning outcomes. Finally, this study brought to light the growing popularity of second-career teachers in the science field. These teachers have the opportunity to impart knowledge from the real-world workforce setting on the students that they encounter. Their ability to apply concepts to current problems in their respective field of science education is a unique advantage for the learner in that particular educator's classroom. Exploring that advantage may assist educators in understanding the success of students who are taught by formally trained teachers vs. students who are taught by second-career teachers.

The purpose of this qualitative interview study was to explore the perceptions of high school science teachers using alternative grading to support authentic learning, student self-reflection, and student articulation of their learning. Eleven science educators, creating authentic learning environments in their classrooms, and using alternative grading techniques to gauge knowledge acquisition were interviewed. These participants provided data that confirmed that productive and successful authentic learning environments have educators that employ a variety of tools to address learning in the classroom. These educators truly believed that through their informal assessments, they were able to tap into student's learning potential. The benefits of implementing an authentic learning environment using alternative grading techniques were described as an

increase in student understanding of learned information, an increase in the articulation of learned information skills, and the development of various skills (critical thinking, laboratory procedures, and protocols, etc.) that would benefit the student in a real-world workforce setting.

The essence of this study is that alternative grading supports authentic learning, with alternative grading being defined as both an alternative to grades and the removal of grades. Creating activities to utilize alternative grading techniques require certain skills for an educator. Those skills involve a complete understanding of instructional pedagogy that enables them to tailor instruction and activities to make learning meaningful. Those instructional skills are utilized to pass on knowledge and skills that are crucial for students to learn to be able to perform in the real-world workforce. Alternative grading techniques are the foundation for creating learning environments with the goal of real-world, workforce prepared students.

References

- Abdullah, M. Y., Hussin, S., & Ismail, K. (2019). Implementation of Flipped Classroom Model and Its Effectiveness on English Speaking Performance. *International Journal of Emerging Technologies in Learning*, *14*(9), 130–147.
<https://doi.org/10.3991/ijet.v14i09.10348>
- Anderson, L. W. (2018). A critique of grading: Policies, practices, and technical matters. *Education Policy Analysis Archives*, *26*(45/55), 1–27.
<https://doi.org/10.14507/epaa.26.3814>
- Authentic assessment. (2019). In *Merriam-Webster dictionary*. Retrieved from <https://www.merriam-webster.com/dictionary/authenticassessment>
- Baeten, M., Dochy, F., Struyven, K., Parmentier, E., & Vanderbruggen, A. (2016). Student-centered learning environments: An investigation into student teachers' instructional preferences and approaches to learning. *Learning Environments Research*, *19*(1), 43–62. <https://doi.org/10.1007/s10984-015-9190-5>
- Bagg, R. (2009). OSTRAKOI. *The Yale Review*, *97*(2), 138-141.
<https://doi.org/10.1111/j.1467-9736.2009.00509>
- Barber, W., King, S., & Buchanan, S. (2015). Problem based learning and authentic assessment in digital pedagogy: Embracing the role of collaborative communities. *Electronic Journal of E-Learning*, *13*(2), 59-67.
<https://doi.org/10.1080/0305764X.2019.1590528>
- Barnes, W., & Slate, J. R. (2013). College-readiness is not one-size-fits-all. *Current Issues in Education*, *16*(1), 1-13. Retrieved from www.jstor.org

- Basri, H., Purwanto, P., As'ari, A. R., & Sisworo, S. (2019). Investigating critical thinking skill of junior high school in solving mathematical problem. *International Journal of Instruction*, *12*(3), 745–758. <https://doi.org/10.29333/iji.2019.12345a>
- Bdiwi, R., de Runz, C., Faiz, S., & Cherif, A. A. (2019). Smart learning environment: Teacher's role in assessing classroom attention. *Research in Learning Technology*, *27*. <https://doi.org/10.25304/rlt.v27.2072>
- Bektas, M. (2019). Examining the teacher candidates' metaphorical perceptions related to the notion of authentic learning. *International Online Journal of Educational Sciences*, *11*(2), 81–99. <https://doi.org/10.15345/iojes.2019.02.006>
- Bowen, B., & Peterson, B. (2019). Exploring authenticity through an engineering-based context in a project-based learning mathematics activity. *Journal of Pre-College Engineering Education Research*, *9*(1), 1–10. <https://doi.org/10.7771/2157-9288.1073>
- Bradbury, H. (2010). Beyond reflective practice. [electronic resource]: new approaches to professional lifelong learning. Routledge. <https://doi.org/10.4324/9780203873175>
- Brewer, T. J., & deMarrais, K. (2015). Teach for America counter-narratives: Alumni speak up and speak out. New York, NY: Peter Lang. <https://doi.org/10.3726/978-1-4539-1556-1>
- Brookhart, S. M., Guskey, T. R., Bowers, A. J., McMillan, J. H., Smith, J. K., Smith, L. F., ... Welsh, M. E. (2016). A century of grading research: Meaning and value in

- the most common educational measure. *Review of Educational Research*, 86(4), 803-848. <https://doi.org/10.3102/0034654316672069>
- Carlson, J. R. (2019). "How Am I Going to Handle the Situation?" The role(s) of reflective practice and critical friend groups in secondary teacher education. *International Journal for the Scholarship of Teaching and Learning*, 13(1). <https://doi.org/10.20429/ijstl.2019.130112>
- Cavilla, D. (2017). The effects of student reflection on academic performance and motivation. *SAGE Open*, 7(3). <https://doi.org/10.1177/2158244017733790>
- Cetinkaya, M. (2018). A study of developing an attitude scale towards authentic learning environments and evaluation. *Journal of Education and Training Studies*, 6(4), 189–198. <https://doi.org/10.11114/jets.v6i4.2887>
- Chiu, P., Pu, Y., Kao, C., Wu, T., & Huang, Y. (2018). An authentic learning-based evaluation method for mobile learning in higher education. *Innovations in Education and Teaching International*, 55(3), 336–347. <https://doi.org/10.1080/14703297.2017.1417147>
- Clandinin, D. J., & Connelly, F. M. (2000). Narrative inquiry: Experience and story in qualitative research. Jossey-Bass, San Francisco.
- Cleveland, L., & Reinsvold, R. (2017). Development of oral communication skills by undergraduates that convey evolutionary concepts to the public. *Journal of Microbiology & Biology Education*, (1). <https://doi.org/10.1128/jmbe.v18i1.1227>
- Cooke, S. J., Gallagher, A. J., Sopinka, N. M., Nguyen, V. M., Skubel, R. A., Hammerschlag, N., & Danylchuk, A. J. (2017). Considerations for effective

science communication. *FACETS* 2, 233- 248. <https://doi.org/10.1139/facets-2016-0055>

Cremers, P. H. M., Wals, A. E. J., Wesselink, R., & Mulder, M. (2016). Utilization of design principles for hybrid learning configurations by interprofessional design teams. *Instructional Science*, 45(2), 289–309. <https://doi.org/10.1007/s11251-016-9398-5>

Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches*. Los Angeles: SAGE.

Creswell, J. W. (2016). *Qualitative inquiry & research design: Choosing among the five approaches* (4th ed.). Thousand Oaks, CA: SAGE.

Demir, M., Tananis, C. A., & Basbogaoglu, U. (2018). Comparative investigation of alternative assessment methods used in turkey and United States elementary 4th grade mathematics curriculum. *International Journal of Educational Administration and Policy Studies*, 10(7), 72–82. <https://doi.org/10.5897/IJEAPS2018.0561>

Demmans Epp, C., Akcayir, G., & Phirangee, K. (2019). Think twice: Exploring the effect of reflective practices with peer review on reflective writing and writing quality in computer-science education. *Reflective Practice*. <https://doi.org/10.1080/14623943.2019.1642189>

Dewey, J. (1933). *How We Think: A Restatement of Reflective Thinking to the Educative Process*. Boston: D. C. Heath. (Original work published in 1910)

- Dignath, C., & Buttner, G. (2018). Teachers' direct and indirect promotion of self-regulated learning in primary and secondary school mathematics classes -- Insights from video-based classroom observations and teacher interviews. *Metacognition and Learning, 13*(2), 127–157. <https://doi.org/10.1007/s11409-018-9181-x>
- Diwakar, A., & Noronha, S. (2018). Usability and usefulness of ADVicE Tool experiment design guidelines for virtual laboratories. 2018 IEEE Tenth International Conference on Technology for Education (T4E), Technology for Education (T4E), 2018 IEEE Tenth International Conference on, T4E, 146. <https://doi.org/10.1109/T4E.2018.00039>
- Docan-Morgan, T. (2012). Positive and negative incentives in the classroom: An analysis of grading systems and student motivation. *Journal of the Scholarship of Teaching and Learning, 6*(2), 21-40. Retrieved from www.scholarworks.iu.edu
- Eather, N., Rileya, N., Miller, D., & Imig, S. (2019). Evaluating the impact of two dialogical feedback methods for improving pre-service teacher's perceived confidence and competence to teach physical education within authentic learning environments. *Journal of Education and Training Studies, (7)*32. <https://doi.org/10.11114/jets.v7i8.4053>
- Egan, S., Waugh, F., Giles, R., & Bowles, W. (2017). Authentic assessment: Partners in developing a web-based guide. *Social Work Education, 36*(6), 731–744. <https://doi.org/10.1080/02615479.2017.1303042>

- Fairman, J., Johnson, A., Mette, I., Wickerd, G., LaBrie, S., & University of Southern Maine, M. E. P. R. I. (2018). *A Review of Standardized Testing Practices and Perceptions in Maine*. Center for Education Policy, Applied Research, and Evaluation. Center for Education Policy, Applied Research, and Evaluation. Retrieved from: <https://eric.ed.gov/>
- Ghosh, S., Bowles, M., Ranmuthugala, D., & Brooks, B. (2017). Improving the validity and reliability of authentic assessment in seafarer education and training: a conceptual and practical framework to enhance resulting assessment outcomes. *WMU Journal of Maritime Affairs* 16(2). <https://doi.org/10.1007/s13437-017-0129-9>
- Gozuyesil, E., & Tanriseven, I. (2017). A Meta-analysis of the effectiveness of alternative assessment techniques. *Eurasian Journal of Educational Research*, 70, 37-56. <https://doi.org/10.14689/ejer.2017.70.3>
- Grainger, P., & Weir, K. (2016). An alternative grading tool for enhancing assessment practice and quality assurance in higher education. *Innovations in Education & Teaching International*, 53(1), 73–83. <https://doi.org/10.1080/14703297.2015.1022200>
- Grant, D., & Green, W. (2013). Grades as incentives. *Empirical Economics*, 44(3), 1563–1592. <https://doi.org/10.1007/s00181-012-0578-0>
- Greenstein, L. (2010). What teachers really need to know about formative assessment. Alexandria, Virginia USA: ASCD.

- Gubrium, J., Holstein, J., Marvasti, A., & McKinney, K. (2012). *The SAGE Handbook of Interview Research: The Complexity of the Craft*. Thousand Oaks, California, United States: SAGE Publications, Inc. <https://doi.org/10.4135/9781452218403>
- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, 18(1), 59–82. <https://doi.org/10.1177/1525822X05279903>
- Guest, G., Namey, E., & Mitchell, M. (2013). *Collecting Qualitative Data: A Field Manual for Applied Research*. 55 City Road, London: SAGE Publications. <https://doi.org/10.4135/9781506374680>
- Gulikers, J. T. M., Bastiaens, T. J., & Kirschner, P. A. (2004). A five-dimensional framework for authentic assessment. *Educational Technology Research & Development*, 52(3), 67–86. <https://doi.org/10.1007/BF02504676>
- Gundogan, A., & Gultekin, M. (2018). The reflection of the attitudes and learning processes to learning environments with authentic tasks in life science class. (English). *Pegem Journal of Education & Instruction / Pegem Egitim ve Öğretim*, 8(4), 771–832. <https://doi.org/10.14527/pegegog.2018.030>
- Hawley, T. S., & Whitman, G. M. (2020). Fear and learning in student teaching: Accountability as gatekeeper in social studies. *The Journal of Social Studies Research*. <https://doi-org.ezp.waldenulibrary.org/10.1016/j.jssr.2019.04.003>.
- Harjo, B., Kartowagiran, B., & Mahmudi, A. (2019). Development of Critical Thinking

- Skill Instruments on Mathematical Learning High School. *International Journal of Instruction*, 12(4), 149–166. <https://doi-org.ezp.waldenulibrary.org/10.29333/iji.2019.12410a>.
- Hennink, M. M., Kaiser, B. N., & Weber, M. B. (2019). What influences saturation? Estimating sample sizes in focus group research. *Qualitative Health Research*, 29(10), 1483–1496 doi:10.1177/1049732318821692.
- Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. *Educational Technology Research and Development*, 48(3), 23–48. <https://doi.org/10.1007/BF02319856>
- Herrington, J., Oliver, R., & Reeves, T. C. (2010). *A Guide to Authentic E-Learning*. New York: Routledge. <https://doi.org/10.4324/9780203864265>
- Herrington, J., Parker, J., & Boase-Jelinek, D. (2014). Connected authentic learning: Reflection and intentional learning. *Australian Journal of Education*, 58(1), 23–35. <https://doi.org/10.1177/0004944113517830>
- Horning, M., Schneider, R., Beacham, B., McKechnie, A., Kirk, L., Emery, D., & Lindquist, R. (2019). Appreciation of the Research-Practice Link: Authentic Learning Environments for Writing-Intensive Nursing Courses. *Nursing Education Perspectives*. <https://doi-org.ezp.waldenulibrary.org/10.1097/01.NEP.0000000000000568>
- Hynes, W., & Kwon, H. J. (2018). An evaluation of oral presentation competency in interior design education. *International Journal of Art & Design Education*, 37(3), 387–398. <https://doi.org/10.1111/jade.12134>

- Iqbal, M. Z. (2017). Reflection-in-Action: A stimulus reflective practice for professional development of student teachers. *Bulletin of Education and Research*, 39(2), 65–82. Retrieved from www.pu.edu.pk
- Irwanto, Saputro, A. D., Rohaeti, E., & Prodjosantoso, A. K. (2019). Using Inquiry-Based Laboratory Instruction to Improve Critical Thinking and Scientific Process Skills among Preservice Elementary Teachers. *Eurasian Journal of Educational Research*, (80), 151–170. Retrieved from www.ejer.com.tr
- Isnaeni, A., Wulan, R., & Solihat, R. (2017). Do performance assessment have contribution to achieve students' communication skills? *International Journal of Science and Applied Science: Conference Series*, (1)24.
<https://doi.org/10.20961/ijsascs.v2i1.16670>
- Jackson, M. A., Tran, A., Wenderoth, M. P., & Doherty, J. H. (2018). Peer vs. self-grading of practice exams: Which is better? *CBE - Life Sciences Education*, 17(3).
<https://doi.org/10.7717/peerj.4303>
- Jacob, S. A., & Furgerson, S. P. (2012). Writing interview protocols and conducting interviews: Tips for students new to the field of qualitative research. *Qualitative Report*, 17. Retrieved from www.tqr.nova.edu
- James, N. (2017). You've got mail ...! Using email interviews to gather academics' narratives of their working lives. *International Journal of Research & Method in Education*, 40(1), 6-18. <https://doi.org/10.1080/1743727X.2015.1056136>
- Kang, D., Goico, S., Ghanbari, S., Bennallack, K., Pontes, T., O'Brien, D., & Hargis, J. (2019). Providing an oral examination as an authentic assessment in a large

- section, undergraduate diversity class. *International Journal for the Scholarship of Teaching & Learning*, 13(2), 1-14. <https://doi.org/10.20429/ijstl.2019.130210>
- Karabulut-Ilgu, A., Yao, S., Savolainen, P., & Jähren, C. (2018). Student perspectives on the flipped-classroom approach and collaborative problem-solving process. *Journal of Educational Computing Research*, 56(4), 513. <https://doi.org/10.1177/0735633117715033>
- Karim, A. A., Abduh, A., Manda, D., & Yunus, M. (2018). The effectivity of authentic assessment based character education evaluation model. *TEM Journal*, 7(3), 495–500. Retrieved from www.temjournal.com
- Kashani-Vahid, L., Afrooz, G., Shokoohi-Yekta, M., Kharrazi, K., & Ghobari, B. (2017). Can a creative interpersonal problem-solving program improve creative thinking in gifted elementary students? *Thinking Skills and Creativity*, 24, 175-185. <https://doi.org/10.1016/j.tsc.2017.02.011>
- Kaya, I. (2018). Examination of Preschool Teachers' Opinion on Alternative Assessment. *Universal Journal of Educational Research*, 6(10), 2294–2299. <https://doi.org/10.13189/ujer.2018.061028>
- Keinänen, M., Ursin, J., & Nissinen, K. (2018). How to measure students' innovation competences in higher education: Evaluation of an assessment tool in authentic learning environments. *Studies in Educational Evaluation*, 58, 30–36. <https://doi.org/10.1016/j.stueduc.2018.05.007>

- Key, T. M., Czaplewski, A. J., & Ferguson, J. M. (2019). Preparing Workplace-Ready Students with Digital Marketing Skills. *Marketing Education Review*, 29(2), 131–135. <https://doi-org.ezp.waldenulibrary.org/10.1080/10528008.2019.1610331>
- Kimmons, R., & Veletsianos, G. (2016). Education scholars' evolving uses of twitter as a conference backchannel and social commentary platform. *British Journal of Educational Technology*, 47(3), 445–464. <https://doi.org/10.1111/bjet.12428>
- Kinay, I. (2018). Investigation of Prospective Teachers' Beliefs towards Authentic Assessment. *World Journal of Education*, 8(1), 75–85. <https://doi.org/10.5430/wje.v8n1p75>
- Kinay, I., & Ardic, T. (2017). Investigating teacher candidates' beliefs about standardized testing. *Universal Journal of Educational Research*, 5(12), 2286–2293. <https://doi.org/10.13189/ujer.2017.051219>
- Kinay, I., & Bagececi, B. (2016). The investigation of the effects of authentic assessment approach on prospective teachers' problem-solving skills. *International Education Studies*, 9(8), 51–59. <https://doi.org/10.5539/ies.v9n8p51>
- Klapp, A., Cliffordson, C., & Gustafsson, J. E. (2016). The effect of being graded on later achievement: evidence from 13-year-olds in Swedish compulsory school. *Educational Psychology*, 36(10), 1771–1789. <https://doi.org/10.1080/01443410.2014.933176>
- Koh, K. (2017). Authentic Assessment. *Oxford Research Encyclopedia of Education*. <https://doi.org/10.1093/acrefore/9780190264093.013.22>

- Kohn, A. (1999). *Punished by Rewards: The Trouble with Gold Stars, Incentive Plans, A's, Praise, and Other Bribes*. New York: Houghton Mifflin Harcourt.
- Kolb, D. A. (1984). *Experiential Learning: Experience as a Source of Learning and Development*. Englewood Cliffs, NJ: Prentice-Hall.
- Kolomuc, A. (2017). Subject-specific science teachers' views of alternative assessment. *Asia-Pacific Forum on Science Learning & Teaching*, 18(1), 1–17. Retrieved from www.eduhk.hk
- Korkko, M., Kyro-Ammala, O., & Turunen, T. (2016). Professional development through reflection in teacher education. *Teaching and Teacher Education*, 55, 198-206. <https://doi.org/10.1016/j.tate.2016.01.014>
- Kosteklioglu, I., & Celen, U. (2016). Oz degerlendirme yonteminin etkililiginin degerlendirilmesi. [Evaluation of the effectiveness of self-assessment method]. *Elementary Education Online*, 15(2), 671-681. <https://doi.org/10.17051/ieo.2016.44304>
- LaPelle, N. (2004). Simplifying qualitative data analysis using general purpose software tools. *Field Methods*, 16(1), 85–108. <https://doi-org.ezp.waldenulibrary.org/10.1177/1525822X03259227>
- Larsen, D. P., London, D. A., & Emke, A. R. (2016). Using reflection to influence practice: student perceptions of daily reflection in clinical education. *Perspectives on Medical Education*, 5(5), 285–291. <https://doi.org/10.1007/s40037-016-0293-1>
- Lee, D., Foster, E., & Snaith, H. (2016). Implementing the employability agenda: A critical review of curriculum developments in political science and international

relations in English universities. *Politics*, 36(1), 95–111.

<https://doi.org/10.1111/1467-9256.12061>

Link, L. (2018). Teachers' perceptions of grading practices: How pre-service training makes a difference. *Journal of Research in Education*, 28(1), 62–91. Retrieved from www.eric.ed.gov

Luo, T., Murray, A., & Crompton, H. (2017). Designing authentic learning activities to train pre-service teachers about teaching Online. *International Review of Research in open and distributed Learning*, 18(7).

<https://doi.org/10.19173/irrodl.v18i7.3037>

Mack, N., Woodsong, C., MacQueen, K., Guest, G., & Namey, E. (2005). *Qualitative research methods: A data collector's field guide*.

Martínez-Argüelles, M. J., Fitó, A., & Plana-Erta, D. (2018). Building an authentic e learning environment: the case of financial statements analysis. DOI: 10.21125/edulearn.2018.1807

Mason, M. (2010). Sample size and saturation in PhD studies using qualitative interviews. *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*, 11(3), article 8. Retrieved from www.qualitative-research.net

Mawson, M., & Haworth, A. C. (2018). Supporting the employability agenda in university libraries: A case study from the University of Sheffield. *Information and Learning Science*, (1/2), 101. <https://doi.org/10.1108/ILS-04-2017-0027>

McDougall, J., & Holden, H. (2017). The silence about oral presentation skills in distance and online education: new perspectives from an Australian university preparatory

programme. *Open Learning*, 32(2), 163–176.

<https://doi.org/10.1080/02680513.2017.1316187>

McKenney, S., & Reeves, T. (2019). *Conducting Educational Design Research*, 2nd Edition. New York, NY: Routledge.

McLaren, I. (2019). Science students' responses to an oral communication skills development initiative: Attitude and motivation. *International Journal of Teaching & Learning in Higher Education*, 31(1), 73. Retrieved from www.isetl.org/ijtlhe/

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

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed.). San Francisco, CA: John Wiley & Sons.

Merritt, R. D. (2019). Alternative Assessment. *Alternative Assessment. Research Starters Education*, 1.

Minocha, S., Hristov, D., & Leahy-Harland, S. (2018). Developing a future-ready global workforce: A case study from a leading UK university. *International Journal of Management Education*, 16(2), 245–255. <https://doi-org.ezp.waldenulibrary.org/10.1016/j.ijme.2018.03.002>

Moore, T., & Morton, J. (2017). The myth of job readiness ? Written communication, employability, and the “skills gap” in higher education. *Studies In Higher Education*, 42(3), 591–609. <https://doi.org/10.1080/03075079.2015.1067602>

- Moran, W., Vozzo, L., Reid, J. A., Pietsch, M., & Hatton, C. (2013). How can technology make this work? Preservice teachers, off-campus learning and digital portfolios. *Australian Journal of Teacher Education*, 38(5), 5.
<https://doi.org/10.14221/ajte.2013v38n5.9>
- Murillo-Zamorano, L. R., & Montanero, M. (2018). Oral presentations in higher education: a comparison of the impact of peer and teacher feedback. *Assessment & Evaluation in Higher Education*, 43(1), 138–150.
<https://doi.org/10.1080/02602938.2017.1303032>
- Myers, S. (2018). Norm-Referenced Testing. Salem Press Encyclopedia.
- Myers, S. (2019). Criterion-Referenced Testing. Salem Press Encyclopedia.
- Myers, M. D., & Newman, M. (2007). The qualitative interview in IS research: Examining the craft. *Information and Organization*, 17(1), 2-26. <https://doi-org.ezp.waldenulibrary.org/10.1016/j.infoandorg.2006.11.001>.
- Myers, M. D., & Newman, M. (2007a). The qualitative interview in IS research: Examining the craft. *Information and Organization*, 17(1), 2-26.
[doi:10.1016/j.infoandorg.2006.11.001](https://doi.org/10.1016/j.infoandorg.2006.11.001).
- Naeimi, H. F., Zare, H., Hormozi, M., Shaghghi, F., & Kaveh, M. (2011). Designing and implementing a situated learning program and determining its impact on the students' school motivation and academic achievement. *Turkish Online Journal of Distance Education*, 13(2), 36-47. Retrieved from www.tojde.anadolu.edu.tr

- Nauman, S. (2017). Lack of critical thinking skills leading to research crisis in developing countries: A case of Pakistan. *Learned Publishing, 30*(3), 233–236. <https://doi-org.ezp.waldenulibrary.org/10.1002/leap.1091>
- Nikolic, S., Stirling, D., & Ros, M. (2018). Formative assessment to develop oral communication competency using YouTube: self- and peer assessment in engineering. *European Journal of Engineering Education, 43*(4), 538–551. <https://doi.org/10.1080/03043797.2017.1298569>
- O'Connor, K. (2017). *How to Grade for Learning: Linking Grades to Standards*, 4th Edition. Thousand Oaks, CA: Corwin.
- Ott, L. E., Carpenter, T. S., Hamilton, D. S., & LaCourse, W. R. (2018). Discovery learning: Development of a unique active learning environment for introductory chemistry. *Journal of the Scholarship of Teaching and Learning, 18*(4), 161–180. <https://doi.org/10.14434/josotl.v18i4.23112>
- Pai, H.-C., Ko, H., Eng, C.-J., & Yen, W.-J. (2017). The mediating effect of self-reflection and learning effectiveness on clinical nursing performance in nursing students: A follow-up study. *Journal of Professional Nursing, 33*(4), 287–292. <https://doi-org.ezp.waldenulibrary.org/10.1016/j.profnurs.2017.01.003>
- Patton, M. Q. (2015). *Qualitative research & evaluation methods: Integrating theory and practice* (4th ed.). Thousand Oaks, CA: SAGE.
- Pea, R. D. (1991). Learning through multimedia. *IEEE Computer Graphics and Applications, 11*(4): 58–66. <https://doi.org/10.1109/38.126882>

- Pearce, S. (2016). Authentic learning: what, why and how? *e-Teaching Management Strategies for the Classroom*, 10(1), 1-3. Retrieved from www.acel.org.au
- Peltola, A. (2018). The classroom as think tank: Small groups, authentic exercises, and instructional scaffolding in an advanced writing course. *International Journal of Teaching and Learning in Higher Education*, 30(2), 322–333. Retrieved from www.isetl.org/ijtlhe/
- Percell, J. C. (2014). *Essentially point-less: The influence of alternative, non-points-based grading on teachers' instructional practices* (Doctoral dissertation). Retrieved ProQuest Dissertations and Theses database. (UMI No. 3643267)
- Percell, J. (2017) Lessons from alternative grading: Essential qualities of teacher feedback. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 90(4), 111-115. <https://doi.org/10.1080/00098655.2017.1304067>
- Price, J. H., & Murnan, J. (2004). Research limitations and the necessity of reporting them. *American Journal of Health Education*, 35(2), 66-67. <https://doi.org/10.1080/19325037.2004.10603611>
- Priestly, M., Biesta, G., & Robinson, S. (2015). *Teacher agency: An ecological Approach*. New York: Bloomsbury Academic Publishing.
- Rajput, A. S. (2017). Science communication as an academic discipline: An Indian perspective. *Current Science*, 113(12), 2262-2267. <https://doi.org/10.18520/cs/v113/i12/2262-2267>
- Rubin, H. J., & Rubin, I. S. (2012). *Qualitative interviewing: The art of hearing data* (3rd ed.). Thousand Oaks, CA: SAGE.

- Sabtiawan, W. B., Yuanita, L., & Rahayu, Y. S. (2019). Effectiveness of authentic assessment: Performances, attitudes, and prohibitive factors. *Journal of Turkish Science Education, 16*(2), 156-175. Retrieved from www.tused.org
- Sagita, V., & Rahayu, W. (2019). Developing performance assessment-based authentic assessment of business plan subject. *Jurnal Pendidikan Ekonomi Dan Bisnis (JPEB), (1)*31. <https://doi.org/10.21009/JPEB.007.1.4>
- Saldana, J. (2016). *The Coding Manual for Qualitative Researchers* (3rd ed.). London, UK: SAGE.
- Schinske, J., & Tanner, K. (2014). Teaching more by grading less (or differently). *Life Sciences Education, 13*(2), 159-166. <https://doi.org/10.1187/cbe.cbe-14-03-0054>
- Schmidt-Jones, C. (2017). Offering authentic learning activities in the context of open resources and real-world goals: A study of self-motivated online music learning. *European Journal of Open, Distance and E-Learning, 20*(1), 111–125. <https://doi.org/10.1515/eurodl-2017-0007>
- Schneider, J., & Hutt, E. (2014). Making the grade: a history of the A-F marking scheme. *Journal of Curriculum Studies, 46*(2), 201–224. <https://doi.org/10.1080/00220272.2013.790480>
- Schon, D. A. (1987). *Jossey-Bass higher education series. Educating the reflective practitioner: Toward a new design for teaching and learning in the professions*. San Francisco, CA, US: Jossey-Bass.
- Scogin, S. C., Kruger, C. J., Jekkals, R. E., & Steinfeldt, C. (2017). Learning by experience in a standardized testing culture: Investigation of a middle school

experiential learning program. *Journal of Experiential Education*, 40(1), 39–57.

<https://doi.org/10.1177/1053825916685737>

Seymour, E., & Hewitt, N. (1997). *Talking about Leaving: Why Undergraduates Leave the Sciences*. Boulder, CO: Westview.

Shafeek, S., Viswambaran, V., & Baby, B. (2019). An evaluation of the development of formative assessment strategies to enhance student learning and engagement.

Advances in Science and Engineering Technology International Conferences

(ASET), 2019. <https://doi.org/10.1109/ICASET.2019.8714339>

Sharma, N., Lau, C. S., Doherty, I., & Harbutt, D. (2015). How we flipped the medical classroom. *Medical Teacher*, 37(4), 327–330.

<https://doi.org/10.3109/0142159X.2014.923821>

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

2004-22201

Siles-Gonzalez, J., & Solano-Ruiz, C. (2016). Self-assessment, reflection on practice and critical thinking in nursing students. *Nurse Education Today*, 45, 132–137.

<https://doi.org/10.1016/j.nedt.2016.07.005>

Slade, M. L., Burnham, T. J., Catalana, S. M., & Waters, T. (2019). The impact of reflective practice on teacher candidates' learning. *International Journal for the Scholarship of Teaching & Learning*, 13(2), 1–8.

<https://doi.org/10.20429/ijstl.2019.130215>

- Smallwood, M. L. (1935). *An Historical Study of Examinations and Grading Systems in Early American Universities: A Critical Study of the Original Records of Harvard, William and Mary, Yale, Mount Holyoke, and Michigan from Their Founding to 1900*, vol. 24. Cambridge, MA: Harvard University Press.
- Starko, A. (2017). *Creativity in the classroom: Schools of curious delight*, 6th Edition. New York, NY: Routledge. <https://doi.org/10.4324/9781315391625>
- Steiner, H. H. (2016). The strategy project: Promoting self-regulated learning through an authentic assignment. *International Journal of Teaching and Learning in Higher Education*, 28(2), 271–282. Retrieved from www.isetl.org/ijtlhe/
- Stiles, E., & Dexter, F. B. (1901). *The literary diary of Ezra Stiles*.
- Tajeddin, Z., & Aghababazadeh, Y. (2018). Blog-Mediated Reflection for Professional Development: Exploring Themes and Criticality of L2 Teachers' Reflective Practice. *TESL Canada Journal*, 35(2), 26–50. <https://doi.org/10.18806/tesl.v35i2.1289>
- Taylor, S., Bogdan, R., & DeVault, M. (2016). *Introduction to qualitative research Methods : A guidebook and resource* (4th ed.). Hoboken, NJ : Johnson Wiley & Sons, Inc.
- Teräs, H., Teräs, M., & Herrington, J. (2012). A reality check: Taking authentic e learning from design to implementation. *EdMedia + Innovate Learning*, 2219-2228.
- Thibodeaux, T., Harapnuik, D., & Cummings, C. (2019). Student perceptions of the influence of the COVA learning approach on authentic projects and the learning

- environment. *International Journal on E-Learning*, 18(1), 79-101. Retrieved from www.ace.org
- Thurab-Nkhosi, D., Williams, G., & Mason-Roberts, M. (2018). Achieving confidence in competencies through authentic assessment. *Journal of Management Development*, 37(8), 652–662. <https://doi.org/10.1108/JMD-12-2017-0413>
- Tobias, S. (1990). *They're Not Dumb, They're Different: Stalking the Second Tier*. Tucson, AZ: Research Corporation.
- Train, T. L., & Miyamoto, Y. J. (2017). Encouraging science communication in an undergraduate curriculum improves students' perceptions and confidence. *Journal of College Science Teaching*, 46(4), 76-83. https://doi.org/10.2505/4/jcst17_046_04_76
- Turner, D. W. (2010). Qualitative Interview Design: A Practical Guide for Novice Investigators. *Qualitative Report*, 15(3), 754–760.
- van Wessel, M. (2018). Narrative Assessment: A new approach to evaluation of advocacy for development. *Evaluation*, 24(4), 400–418. <https://doi.org/10.1177/1356389018796021>
- Villaber, A., & Gonzaga, M. (2018). Effectiveness of the implementation of oral examination to the communication skills of college students in one academic institution in the Philippines. *Asia Pacific Journal of Multidisciplinary Research*, (3)31. Retrieved from www.apjmr.com
- Widiastuti, I. (2018). Teachers' classroom assessment and grading practices. SHS Web of Conferences, 00052. <https://doi.org/10.1051/shsconf/20184200052>

- Wiggins, G. (2011). A true test: Toward more authentic and equitable assessment. *Phi Delta Kappan*, 92(7), 81-93. <https://doi.org/10.1177/0031721711109200721>
- Winasih, W. W., Cahyono, B. Y., & Prayogo, J. A. (2019). Effect of project-based learning using E-Poster on Indonesian EFL students' speaking ability across personality types. *Arab World English Journal*, 10(1), 73–83. <https://doi.org/10.24093/awej/vol10no1.7>
- Wyatt, M., & Nunn, R. (2019). Tracing the growth of a community of practice centered on holistic project-based learning in communication at an engineering university in the United Arab Emirates: Insights from a socially situated teacher cognition perspective. *Forum: Qualitative Social Research*, 20(2), 1–21. <http://dx.doi.org/10.17169/fqs-20.2.3170>
- Yahaya, N., Sattar, R., & Mohamad, R. (2017). Exploring the authentic teaching and learning experience of the apprentices of the national dual training system. *International Journal of Academic Research in Business and Social Sciences*, 7(3), 690-703. <https://doi.org/10.6007/IJARBS/v7-i6/3023>
- Ydessen, C., & Andreasen, K. (2019). The historical roots of the global testing culture in education. *Foro de Educación*, (26), 1. <https://doi.org/10.14516/fde.710>
- Yin, R. (2014). *Case study research design and methods* (5th ed.). Thousand Oaks, CA: Sage.
- Yin, R. K. (2016). *Qualitative research from start to finish* (2nd ed.). New York, NY: The Guilford Press.

Zwahlen, C. (2018). Authentic learning: Boosting ELL language and academic proficiency development. *International Schools Journal*, 37(2), 85–91. Retrieved from www.isjournal.eu

Appendix: Interview Protocol

Interview Introduction

Welcome, and thank you for participating in my study. This voluntary research study is being conducted to explore the perceptions of high school science teachers regarding the use of alternative grading to support authentic learning, and I am looking forward to learning about your experiences within this type of setting. Before we begin, I would like to review the specifications for your participation today. By replying “Yes, I consent” to my email invitation, you provided your informed consent to participate in this study, therefore, by agreeing to participate in this study, you are agreeing to participate in a one-time, individual interview, and, if needed, a follow-up email conversation. Participating in this study does not pose a risk or direct benefit, but your participation will contribute to the field of education by adding knowledge on the subject of alternative grading approach and authentic learning. Do you have any questions before we begin?

Primary Research Question: How do high school science teachers perceive their implementation of alternative grading as a support for authentic learning?

Associated Initial Interview Questions

1. Walk me through a typical planning period for you.
2. Can you describe any guides or structured classroom models that you use or have referenced to help you write lesson plans/create experiences in the classroom that resemble authentic learning?
3. What types of alternative assessments do you implement in the classroom?
4. How would you describe your grading approach for these assessments?
5. For clarity purposes, would you describe your understanding of traditional versus alternative grading methods to me?
6. Do you ever use real-world workforce example activities in the classroom?
7. To what extent do you consider each approach to contribute to authentic learning experiences?

Prompting Questions:

- 2a. Can you tell me more about that?
- 2b. How does that apply to your specific discipline?
- 3a. Could you explain that type of assessment to me?
- 4a. Can you tell me more about that?
- 6a. What types of activities?
- 6b. Are the activities specific to one discipline?
- 6c. Do you ever consult without outside agencies to see what they are looking for in terms of solutions for the problems associated with activities?

Secondary Research Question (1): What are the perceptions of high school science teachers regarding how alternative grading supports student reflection?

Associated Initial Interview Questions

1. In implementing these alternative grading approaches, did you ever use student reflection?
2. Do you provide written feedback to the student for their work?
3. Do you use peer and self-assessment for reflection?
4. Is the reflection ever calculated into a final grade?
5. Do you maintain a portfolio to assess how students develop in their self-reflection?

Prompting Questions:

1a. Would you explain how you implement the reflection?

2a. Do you feel your feedback encourages self-reflection?

2b. Do students ask you for substantial feedback after assignments have been graded?

3a. If you use peer reflection, do you find the reflections are meaningful?

3b. Do you show students what their peers say to them about their work?

4a. Can you explain to me how you breakdown the calculations with the reflection? incorporated?

5a. Do you use the development as a means to calculate improvement in the subject area?

Secondary Research Question (2): What are the perceptions of high school science teachers regarding how alternative grading supports student articulation of their learning?

Associated Initial Interview Questions

1. Can you describe how you implement articulation of knowledge opportunities in the classroom setting?

2. How do you couple articulation opportunities with alternative grading?

3. Can you explain the student verbal and oral communication skills at the beginning of their experience with you versus the end of the year?

4. Are students better able to articulate their knowledge after their experience with articulation activities?
5. Do you have students mimic oral/verbal presentations that they would give in the work-place setting?
<i>Prompting Questions:</i>
1a. Do you have a preference in activities that promote articulation?
3a. do you use these opportunities as grades?
3b. Is the grading more holistic or representative of traditional grading?
4a. could you provide me with an example of a time you noted a large gain in understanding related to articulation?
5a. Do you collaborate with any institutions to mimic the workforce?

Closing

Thank you so much for taking time out of your day to participate in this study. Please allow up to four weeks for me to transcribe this interview. After that time, I will send you a copy for review, with a maximum of five clarification questions. Once the study has been completed, I will share it with you via email. I cannot thank you enough for sharing your experiences with me and I look forward to being able to use your expertise as a guiding frame for other educators in the field.