UNDERSTANDING THE NGSS AND IMPLEMENTATION IN THE CLASSROOM

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"In times of stress or moments of transition, sometimes it can feel like the whole world is closing in on you. When that happens, you should close your eyes, take a deep breath, listen to the people who love you when they give you advice, and remember what really matters."

-Leslie Knope

ABSTRACT

In 2013, the Next Generation Science Standards (NGSS) were released nationwide for adoption. California was among the first states to adopt the standards, replacing the Science Content Standards that had been used since 1998. NGSS is structured differently than any other standards and calls for a non-traditional way of teaching science through inquiry and exploration to develop deeper understandings of the content. Now, teachers in California are expected to teach to the NGSS to prepare students for the California Science Test (CAST) every Spring in grades 5, 7, and 9, however no curriculum has been created to help guide teachers in unfamiliar territory. It is imperative that teachers are educated on how the new standards look, how to navigate them, and how to properly implement them into all grade level classrooms in order to set our students up for success on the CAST, as well as to promote and encourage STEM related careers in the future.

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CHAPTER 1

Context of the Problem

Next Generation Science Standards (NGSS) are standards that were created to expose students in grades K-12 to the challenging and complex science curriculum that have been surpassed and outdated in the previous Science Content Standards. California had not had new science standards since 1998; therefore, they were overdue for new standards that represented the many changes and discoveries acquired over the past 15 years. Another motivational factor for creating these new standards was the fact that students, age 15, were not performing well in science or mathematics on the Program for International Student Assessment (PISA), an assessment that compares and ranks countries based on their performance in different content areas. In 2009, the U.S. performed lower than 16 countries in science and performed lower than 24 countries in mathematics according to the PISA results.

First, the National Research Council (NRC), the National Science Teachers Association (NSTA), the American Association for the Advancement of Science (AAAS), and Achieve partnered up to develop a framework that outlined the necessary ideas and concepts that students would need to know by the time they exited high school. Next, they took the framework and developed the standards with the help of the lead state representatives. The standards went through multiple drafts after being released privately and to the public for review. In April 2013, NGSS were released and ready for the nation to adopt them as their new State Science Standards. California was the 6th state to adopt these new standards on September 4, 2013.

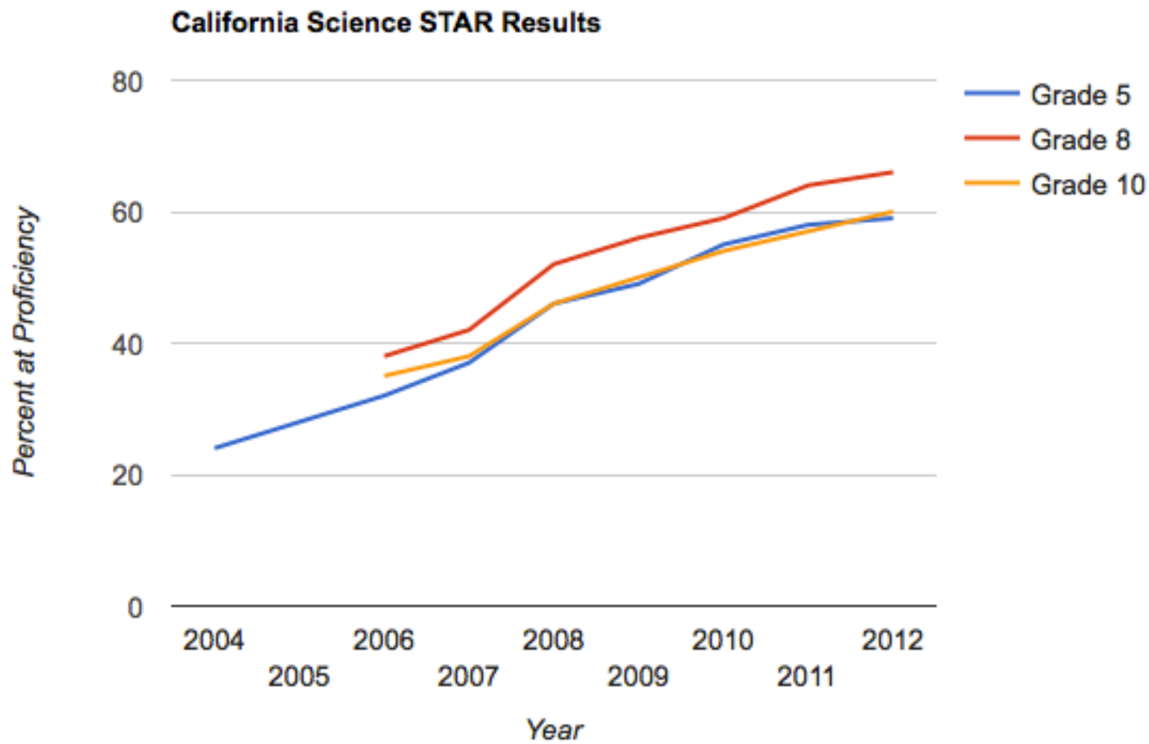
In 2016-2017, California begins an implementation plan to pilot the new California Science Test, assessing students on their ability to meet the NGSS standards. In the 2017-2018 academic year California tracks students test data from the California Science Test. However, the state has not yet developed instructional materials that are aligned to the NGSS. As a result, teachers must use materials that are outdated. They must teacher a curriculum that will not be assessed on the California Science test, and students will be expected to demonstrate their mastery of the NGSS concepts.

As expected, initial test score results for students on the California Standards Test in 2004 ranged according to grade level. Grades 5, 8, and 10 get tested on science standards.

Elementary School scores were represented by the 5th graders of California. 5th grade began in 2004 with 24% of students scoring at proficient or above. They averaged at about a 4.38% increase every year up to 2012, ending at 59% of 5th grade students scoring at proficient or above. That was a total increase of 35% from 2004-2012.

Middle School scores were represented by the 8th graders of California. 8th grade began in 2006 with 38% of students scoring at proficient or above. They averaged at about a 4.67% increase annually up to 2012, ending at 66% of 8th grade students scoring at proficient or above. That was a total increase of 28% from 2006-2012.

High School scores were represented by the 10th graders of California. 10th grade began in 2006 with 34% of students scoring at proficient or above. They averaged at about a 3.17% increase annually up to 2012, ending at 53% of 10th grade students scoring at proficient or above. That was a total increase of 19% from 2006-2012 ("2012 STAR Results Marks Ninth Straight Year of Rising English and Math Scores," 2012).



Although California science scores increased every year, the ultimate objective of having every student score at proficient or above was not being met after 6-8 years. There was not enough growth in that length of time that demonstrated that California could achieve or come close to achieving that goal anytime soon. There was a greater need for updated standards and new instruction to set those other 31-47% students up for success in the area of science.

Common Core State Standards are a list of K-12 standards in the subject areas of ELA and Math. Integrated into those standards are literacy expectations in the areas of Science, Social Studies, and Performing Arts. Common Core (CC) recognizes the fact that students need to read, write, speak, and reason in all areas of practice. Reading is a learned skill; therefore, it is not surprising to have students that struggle in the area of reading. When so much of the curriculum is reading and writing, the rigor needs to increase in order to advance students in literacy skills and education. In science specifically, the text may take many forms such as charts, diagrams, demonstrations, etc., that post additional challenges for students. They need to learn how to make sense of these using science literacy skills. The goal is to prepare students for advanced literacies because at the moment, students are inexperienced or unprepared.

Rationale

This issue is a temporary problem; however, a real problem nonetheless. Combining NGSS, CC, and the old materials that schools currently possess does not serve students positively. The need is for a curriculum that integrates NGSS and CC together cohesively to set our teachers up for success in teaching their students, which in turn will set our students up for success on the CAST and in STEM occupations in the future.

Not only are districts statewide struggling with how to teach these new standards, but some schools are struggling with the weight of their existence on their shoulders. As a Title 1 school, these schools rely on extra funding from the state with high test scores as the driving force. This creates an unimaginable amount of pressure on teachers for their students to perform well on the California Science Test (CAST). Providing these teachers with the necessary materials in order to feel confident and comfortable are a major need when it comes to NGSS and CC. Our overall goal is to help students be successful.

Without appropriate instructional materials that are aligned to the NGSS, students all over California will not be exposed to the same information. Therefore, the data from the testing will not be reliable. The short-term effects will be that students will not pass the test because teachers and students do not have the necessary tools in order to meet those standards. Looking past the short-term effects and fast-forwarding to the future, the long-term effects will be that students will fall behind in science standards moving forward into middle school, high school, and even college. Their education would not have provided the necessary building blocks in order for students to meet the NGSS.

This necessity that is being held back has the potential to affect careers in STEM occupations and eventually the ranking in technology and engineering in the United States.

Thesis Statement

Having and possessing the necessary materials and curriculum that coincide with NGSS available to districts is extremely important. NGSS is not a nationwide requirement; therefore, it is up to the state to develop new curriculum to match with NGSS and CC. Once the State Board of Education of California creates the curriculum, districts will be able to adopt the new curriculum to disburse amongst its schools. The science curriculum in fifth grade needs to have a curriculum that bridges the current curriculum in schools as well as NGSS and CC. A successful curriculum must include grade level content that merges NGSS and California Common Core State Standards (CCCSS) as a tool for teachers to present to their students to ensure their success on the CAST.

Proposed Overview of Culminating Experience

I will be creating a culminating experience in the form of a Thesis Project. My project will be about the lack of curriculum provided by the state in order to meet the Next Generation Science Standards (NGSS) and Common Core Standards (CC). I will be creating a fifth-grade science template unit that will work for all NGSS topics and that bridges current curriculum with NGSS and CC in order to set my students up for success on the upcoming California Science Test (CAST) as well as prepare them for their future science classes. In the next chapter, I will discuss the different sets of standards, where we are currently in the California Implementation Plan, and the significance of curriculum needed now in the classroom.

Concluding Thoughts

It is important that all students learn according to the new NGSS and CC to score proficient or above on the CAST. My hopes for this Thesis Project is that students meet and exceed the NGSS, but more importantly, that students learn specific science concepts following NGSS topics, learn to think like scientists, learn to enjoy science, and aspire to become scientists. I plan to take this unit and share it with my fifth-grade team to ensure the success of our students. I would like to influence my district to be motivated to get us the necessary materials and curriculum as soon as they are available by the state.

CHAPTER 2

Review of the Literature

This chapter focuses on multiple subtopics: the background of the Common Core standards and the evolution to California Common Core State Standards, the development of the Science Content Standards and why they are irrelevant today, the creation of Next Generation Science Standards and how to navigate the three dimensions of learning for each standard, Science Literacy and its significance towards NGSS, the various types of curriculum and the need for it when it comes to new and unfamiliar standards, the discussions by districts and states toward an NGSS curriculum, and how the current curriculum being used at California Elementary School for science matches with NGSS. These subtopics are meant to provide a background so that the reader understands the need for the product of this project. The literature discussed in this chapter will help to explain the need for curriculum that meets NGSS.

Common Core

In 2009, a group of governors and state commissioners from 48 states, 2 territories, and the District of Columbia gathered to discuss the creation of Common Core State Standards (CCSS). This was due to the lack of consistency throughout the nation. Each state had their own standards that marked students as proficient, but the mark of proficiency varied. These creators met to discuss the possibilities in order to create a constant proficiency line and set all students up for college and career readiness at the same level. It would also make the transition of a student moving schools in different states continue to be on track.

First in creation were the college and career readiness standards which mapped out what every student needed to know by graduation in order to succeed in college, career, and life after the 12th grade. Next were the K-12 standards that mapped out each standard that each student needed to know based on their grade level, in order to meet all standards by graduation. These standards were created by the help of teachers, parents, school leaders, and concerned citizens. In June 2010, the final standards were ready for review, adoption and replacement of previously existing standards. The standards consist of ELA and Math standards with an emphasis of literary integration for Science, Social Studies, and Art. Today, there are collectively 42 states, D.C., 4 territories, and Department of Defense Education Activity (DoDEA) that have adopted and are implementing the CCSS ("Development Process," 2007).

California was among the first states to adopt the new CCSS on September 4, 2013 by the California Department of Education ("NGSS for California Public Schools, K-12 Science", 2018). After adopting the new standards, each state that adopted was allowed to add up to 15% to the standards, whether they were pre-existing standards from their last set, brand new standards, or increased the expectations for certain standards, all while maintaining 100% of the original CCSS (Kendall, Ryan, Alpert, Richardson, & Schwols, 2012, p. 5). For the ELA standards, California added 2 brand new standards, 36 new statements, and 33 added details. For the Mathematics standards, California added 17 new standards, 26 new statements, 8 added details, 2 new domains, and 2 new clusters. These can be seen throughout the California Common Core State Standards (CCCSS) by being bold faced and underlined, italicized, and/or as sub-standards with the original standard number followed by a period and a sub-number. California also moved some standards from higher grade levels to lower grade levels.

Science Content Standards

National Science Education Standards are standards that were created and established by the National Research Council in 1996 to guide and direct science content nationwide. The realization that students were not scientifically literate called for the structured standards of science content. These standards were greatly used throughout the nation to help develop individual state science standards ("National Science Education Standards," 1996, p. 22).

There was an emphasis on science requirements for graduation and student achievement, but what lacked was how to get there. There needed to be a focus on content in order for our students to reach achievement. California took action by reviewing the National Science Education Standards, the Benchmarks for Science Literacy, and standards that had been developed in multiple districts throughout California ("Science Content Standards for California Public Schools," 1998, p. viii). The standards were developed by the California State Board of Education and the Academic Standards Commission with the help of families, educators, and business and community leaders. The Science Content Standards for the California Public School System, grades K-12 were adopted on October 9, 1998. These were the first ever science standards for the state of California ("Science Content Standards for California Public Schools," 1998).

Elementary School scores started in 2004 showing 24% of 5th grade students scored at proficient or above and ended in 2012 showing that 59% of 5th grade students scored at proficient or above with a 35% total increase in 8 years. Middle School scores started in 2006 showing 38% of 8th grade students scored at proficient or above and ended in 2012 showing that 66% 8th grade students scored at proficient or above with a 28% total increase in 6 years. High School scores started in 2006 showing 34% of 10th grade students scored at proficient or above and ended in 2012 showing that 53% 10th grade students scored at proficient or above with a 19% total increase in 6 years ("2012 STAR Results Marks Ninth Straight Year of Rising English and Math Scores," 2012).

Although California science scores increased every year, the ultimate objective of having every student score at proficient or above was not being met after 6-8 years. There was not enough growth in that length of time that demonstrated that California could achieve or come close to achieving that goal anytime soon, thus a greater need for those other 31-47% of students.

As of 2013, the National Science Education Standards have been replaced by the Next Generation Science Standards. Teachers have been encouraged to immediately begin using the NGSS to teach science curriculum, but many have had limited to no training with how to read, understand, and implement them in the classroom.

Next Generation Science Standards

Because the Science Content Standards had not been updated in 15 years, there was a need for new science standards that met the needs of the scientifically growing and innovating world of today. Hoeg and Bencze (2017) explained, "The Next Generation

Science Standards (NGSS) were designed to address poor science and math performance in United States schools by inculcating globally competitive science, technology, engineering, and mathematics literacies relevant to participation in future society" (p. 278). There have been major advances that occurred since the time that those standards came out that made them less relevant to today's scientific field and education in regards to how students learn science. With such a rapid growth of innovation in STEM, there were very few students able or interested in attending college to enter STEM careers, therefore the need for new standards were looked at to build interest in STEM and to encourage students to attend college with interest in STEM careers. In addition, they were created to ensure every student graduates as scientifically literate individuals with the opportunity and hope to grow in the field ("Next Generation Science Standards Fact Sheet," 2018). In order to accomplish that, new standards with clear expectations and goals needed to be established. With those standards in place, they can drive curriculum, instruction, and assessments in the right direction. For students that choose not to go into STEM careers, they will continue to benefit from these standards with college and career readiness techniques by learning critical thinking and inquiry-based problem-solving skills.

The NGSS are developed by 26 state science representatives and a 40-member writing team made up of teacher, scientists, and educational researchers. The standards are based on the previously developed framework. They made multiple drafts and released it for review to many different groups including the states broad-based committees, large stakeholder groups, and the public ("Next Generation Science Standards Fact Sheet," 2018). They received large amounts of feedback which led to what the final NGSS are today. Windschitl and Stroupe (2017) describe the standards as being known, “,for their emphasis on students’ use of disciplinary practices...to explore a defined set of disciplinary core ideas and to understand how cross-cutting themes like “cause and effect” or “structure and function” help describe phenomena across many science domains” (p. 251).

NGSS are not like any other standards educators have ever seen. They are created using a three-dimensional learning technique to create a well-rounded scientific education. These dimensions include Scientific and Engineering Practices (SEP), Crosscutting Concepts (CCC), and Disciplinary Core Ideas (DCI). SEP describe the behaviors of scientists and engineers, CCC describe concepts that link to multiple domains and/or standards together, and DCI describe science core ideas. By connecting each technique and relating it to real world issues, students gain a deeper understanding of the concepts and are fully engaged in the learning process.

The NGSS are organized by standard or student Performance Expectations (PE). PE’s give a clear idea of what students should know or be able to do by the end of instruction in order to show proficiency (“How to Read the Next Generation Science Standards,” 2013). This is not what to teach, but rather how to assess student learning and should get the teacher thinking about what they can do to prepare students to meet that PE. Each of these standards integrates and is made up of the three dimensions. SEP is the verb(s), DCI is the core idea that should be known, and CCC is how/when/where the core idea takes place. The standards are organized by either grade level K-5 for elementary school or by grade band- 6-8 for middle school and 9-12 for high school.

There are four domains that make up the standards: Physical Science (PS), Life Science (LS), Earth and Space Science (ESS), and Engineering, Technology, and Applications of Science (ETS). Of these four domains, each one is divided into its primary foundational concepts or DCI. PS is broken into four foundational concepts: PS1- Matter and Interactions, PS2- Motion and Stability: Forces and Interactions, PS3- Energy, and PS4- Wave Properties. LS is broken into four foundational concepts: LS1- From Molecules to Organisms: Structures and Properties, LS2- Ecosystems: Interactions, Energy, and Dynamics, LS3- Heredity: Inheritance and Variation of Traits, and LS4- Biological Evolution: Unity and Diversity. ESS is broken into three foundational concepts: ESS1- Earth's Place in the Universe, ESS2- Earth's Systems, and ESS3- Earth and Human Activity. ETS is made up of only one foundational concept: ETS1- Engineering Design.

When referencing or identifying a standard there is a unique code used for each specific standard and PE. The beginning part describes the grade level or grade band it fits into (K-5, MS, HS). The next part describes the domain that it fits into (PS, LS, ESS, ETS). The domain is followed by a number that describes the foundational concept or DCI of that domain. The last part of the code describes which PE from that domain it is part of. Take the PE 5-PS1-1 for example. The 5 indicates that it fits into 5^{th} grade, next the PS describes that it fits in the Physical Science domain and is followed by a 1 that indicates the DCI of that domain which is *Matter and Its Interactions*, and finally it ends with a 1 that describes the PE from that domain which is to develop a model to describe that matter is made of particles too small to be seen.

Beneath the standard, you will find the standard box that describes each PE. Attached to each PE is a Clarification Statement. This provides examples and/or additional clarification for the PE. Following the Clarification Statement, the majority will also have an Assessment Boundary which clarifies limits to assessments, but not to instruction, that is you may instruct expanded learning or deeper understanding, but when assessing for proficiency you may not go above the PE. Below the standard box, you will find Foundation Boxes. They are divided up by SEP (blue), DCI (orange), and CCC (green). These are directly from the K-12 Framework and are divided up and labeled for each PE. They are used to show what students need to know in order to meet the PE above. Below the Foundation Boxes are Connection Boxes that show other standards that connect additional ideas within the standards in the same grade level, other grade levels, and even connects it to CCSS in ELA and Mathematics.

When designing a three-dimensional experience to meet an NGSS standard, it is going to be a difficult task, but not impossible. The first NGSS strategy to best help teachers begin their transitions into developing an NGSS classroom is to completely flip their way of teaching science or any subject for that matter. NGSS encourages students to explore and construct understanding based off of observations and experimentations through hands-on activities before giving the explanation. That is an SEP section of the standard. This creates inquiry-based learners, engaging students to question why something is or is not or identify a cause and effect. They take that information that they are seeing and collaborate with peers to discuss their observations in order to develop understanding from it. This creates deep thinking and deeper conversation around every DCI. From there, students need to discuss and explain why a phenomenon occurs or develop a solution to a problem. Students are able to learn depth of a DCI and not too much breadth. The depth of the understanding will help them to retain the information and to easily pick up and learn even more the following year in the next grade level.

A great teacher resource is to collaborate with other teachers on the NGSS topic. NGSS has made it very universal when it comes to who is implementing these standards. They can contact any other teacher and both will be familiar with the same language used throughout the standards. It makes it easy to collaborate toward the standards with essentially any teacher that is also implementing these standards.

A beneficial resource that the NGSS has provided is a cohesive storyline that essentially creates a sequenced unit of instruction for educators. It is driven by student inquiry based on a phenomenon or a problem that they are working with for that unit. Through science and engineering practices, students make progress by building upon the information that they have observed and conclusions that they have drawn from previous lessons (NGSS Storylines). The goal of using a storyline is to have students be able to explain a phenomenon demonstrating detail and understanding or to solve the problem presented at the beginning of the unit. This coherently combines the three dimensions of learning for students to master the PE.

Storylines are beneficial, because it is student inquiry driven, and the purpose of the lesson is not hidden. The purpose is exposed to the students so that they have an understanding of why it is important to know and how the information or practice will help them in the future. Students collaboratively construct the questions that lead to investigation through activities that build on the solution. Of course this requires some scaffolding on the teacher's part before beginning lessons and releasing students independently. The teacher will facilitate in the beginning and ween students off as they demonstrate the ability to collaborate effectively with peers.

Inquiry

Along with new science standards, there is an expectation of a new teaching instruction. No longer are teachers expected or encouraged to share the DCI with students before allowing them the chance to experience it themselves. Through the new process of teaching science, students are encouraged to inquire about the phenomenon at hand by performing experiments and developing conclusions based on observations from investigation before teachers deliver a full explanation. Wilcox, Kruse, and Clough (2015) said, "Teaching science through inquiry refers to the pedagogical decisions and actions that teachers make to promote scientific practices such as asking testable questions, creating and carrying out investigations, analyzing and interpreting data, drawing warranted conclusions, and constructing explanations" (p.62). Creating inquiry opportunities for students fully rests on the teacher and their creativity. It does not have to be a hands-on activity that requires a lot of materials and prep, instead it could be a brief video clip that they need to make detailed observations on.

This does not mean that the teacher has no role until the end of the unit. Instead, this calls for an educator to facilitate discussions, prompt students with sentence frames to guide them in their thinking, and to encourage students to collaborate with their classmates while generating ideas and asking questions. Otherwise, students would become frustrated with the lack of guidance, especially in the beginning of this new way of learning. Students also know the expectation when it comes to learning anything in school; therefore, they would become anxious to meet the expectation by themselves and feel like they are working alone, instead of working with the teacher.

This form of teaching promotes critical thinking, problem solving, responsibility, and reflection that traditional directive instruction does not. Through this NGSS teaching design, students will develop a deeper understanding of the DCI through the inquiry process.

Science Literacy

The term *Science Literacy*, using word analysis, means the ability to read and understand science terms in literature and in education.

> Scientific literacy means that a person can ask, find, or determine answers to questions derived from curiosity about everyday experiences. It means that a person has the ability to describe, explain, and predict natural phenomena. Scientific literacy entails being able to read with understanding articles about science in the popular press and to engage in social conversation about the validity of the conclusions. Scientific literacy implies that a person can identify scientific issues underlying national and local decisions and express positions that are scientifically and technologically informed. A literate citizen should be able to evaluate the quality of scientific information on the basis of its source and the methods used to generate it. Scientific literacy also implies the capacity to pose and evaluate arguments based on evidence and to apply conclusions from such arguments appropriately. ("National Science Education Standards," 1996, p.22)

As the block above describes, the term is so much more than just the ability to read a science book or understand a science documentary. It is the ability to perform scientific practices such as analyzing observations and data, recognizing cause and effect, solving real-world problems by using logical strategies, and creating models to benefit whatever the need may be. Of course, these are the independent goals for the futures of students, but they also apply to preparing them to meet CAST proficiency scores for NGSS.

Being science literate does not only serve the science content area, but rather benefits all content areas. For example, ELA encourages analyzing literature. Students who understand what it means to analyze from science or ELA will understand and be familiar with how to analyze something in the other content area. These skills can be transferred to other subjects such as mathematics and ask students to analyze a pattern provided in an algebra performance task. The more that children practice the ability to analyze something, the sooner they will be able to practice this skill on their own and eventually the skill will become a natural instinct and tool to help analyze their events in their own lives outside of the classroom.

According to Banks (2014), “In the age of the NGSS as well as the Common Core State Standards (CCSS), discipline-specific literacy is not just suggested, it’s required if a teacher is to meet the demands of current standards.” NGSS and CCCSS share a cohesive connection when it comes to scientific literacy integrated in the standards. Instead of having the teacher lecture and tell why or what something is, it encourages students to use inquiry-based learning to investigate the problem, analyze the patterns, identify the problem, and to creatively and collaboratively solve the problem all themselves or with peers.

Benchmarks for Science Literacy is what all students should know and be able to do in science, math, and technology at the end of grades 2, 5, 8. And 12. Benchmarks are not a standard or goal, but rather it describes the sequence that educators can use to create and help develop a curriculum or framework. Benchmarks encourage educators to think differently about their curriculum and how they design it for students (AAAS Project 2061, para.3)

Being scientifically literate is imperative for our student's success because so much of the world is dependent on technology, problem solving, inquiry, etc. NGSS prompts those practices that have the ability to train students' thinking in ways that could benefit their future and the future of the country. By encouraging these skills of critical thinking and participating in real-world problem and solution, students can deepen their understanding of science and engineering practices as well as broaden their science literacy skills.

Curriculum and Its Purpose

Education.com defines the term curriculum as a noun that refers to the means and materials with which students will interact for the purpose of achieving identified educational outcomes. There are four types of curriculum: Explicit Curriculum which refers to the explicit or obvious aspects at a school such as the subjects taught or a mission statement of a school, Implicit Curriculum which refers to the hidden aspects at a school such as behavior and character development which is taught upon incident arrival, Null Curriculum which refers to specific content areas within a subject that is purposefully left out and not taught, and finally Extra Curriculum which refers to additional activities that are offered but have no value toward grades such as athletics and clubs (Ebert, Ebert, & Bently, 2013).

When referring to NGSS curriculum, I am referring specifically to explicit curriculum. These standards are explicitly stated and are expected to be known and met at proficient level by every student by the end of each grade level in the state. That is, the fifth-grade classroom is designed to teach these standards. This includes the topics covered in class in every subject as well as any documents used to create lesson plans such as textbooks, films, and internet resources. Curriculum's purpose is to be a tool for teachers to refer to during instruction for ideas, supplemental practice, activities and projects, and assessments. It is not a crutch for a teacher to teach from, but instead it is a guide to help a teacher be the best teacher. It is not meant to be the only resource, but one of many resources that teacher will use to prepare their students. According to Smith and Nadelson (2017), "The NGSS call for teachers to embrace a major shift in their practices to provide opportunities for their students to engage in the practices of professional scientists."

With brand new standards that push heavily on the change of traditional instruction, it becomes extremely apparent that something is missing—curriculum. Educators have been provided the framework and the standards; however, there is no resource or tool to refer to and understand exactly how to create a lesson that effectively integrates the three dimensions of every single standard. What does that look like? Where do I start? In many cases it can create a sense of overwhelming anxiety to many teachers, seasoned or new.

In elementary schools, one teacher is planning lessons for ELA, math, science, social studies, PE, art, music, and character development on a daily and/or weekly basis. There is not a lot of time to dedicate to create a successful lesson in terms of meeting NGSS. There is a very immediate need for a curriculum that provides a structure so that the teacher can follow to create a routine to integrate all three dimensions of each standard, provide supplemental resources to reinforce the idea, and generate formative and summative assessments that efficiently represent the standard to determine proficiency. Whether this comes in the form of a textbook, a teacher guide book, or a pacing guide, something is needed to support and guide teachers in the correct direction to implement these standards correctly and effectively.

Aside from progress monitoring in the classroom, there is another immediate need for curriculum to set students up for success on the CAST, taken in the Spring of each year. Last school year (2016-2017) 5th graders piloted the CAST online. According to the education website, “The purpose of the pilot test is try out the newly developed item types and test system functionality. The completed CAST pilot tests will be used for participation purposes for accountability” (cde.ca.gov). From there, the pilot will also help in developing items for this Spring 2018 field test and gives students and teachers to become familiar with the tools in the CAST.

No data results were released from this test. This current school year (2017-2018) 5th graders will be taking the field test of the CAST online. The purpose will be to collect participation data and report on accountability.

Beginning next school year, the state of California will be implementing the CAST in full affect, which means that data results will be released. Unfortunately, most students will not be prepared the way they should be; therefore, the data will not accurately represent their knowledge and understanding of the new standards. As stated before, curriculum is not expected to be released on the NGSS until early 2019. Typically, districts will take some time to pilot various curriculums to decide which one fits best for the teachers and students. Then districts have to purchase the curriculum, order it, disburse it to the classrooms, and train the teachers. Even if everything was fast-tracked, the earliest classrooms that will benefit from a structured curriculum won’t be until the 2019-2020 school year. That is still 2 years of students that will be taking the CAST and not have the proper instruction to meet proficiency.

Until then, there are a few things that we as teachers must do to help our students perform at their best. First, districts should offer teacher professional development to properly train and explain the NGSS design to every teacher. Hanuscin and Zangori (2016) said it best, "...as the Next Generation Science Standards (NGSSs) call for change in what students learn and how they are taught, teacher education programs must reconsider courses and curriculum in order to prepare teacher candidates to understand and implement new standard." (p. 799). This would allow all teachers to gain a better understanding of the expectations of instruction and how to teach the standards while waiting on a formal curriculum. Second, teachers should take initiative and do a bit of research on what NGSS is and what they can do now in their classrooms to help their students begin meeting those standards. Why reinvent the wheel when we are in a profession that typically shares their ideas in all areas of learning and instruction? Use multiple resources and see what you can take to your classroom. Third, teachers should use their creativity and sharing instincts to come up with a collaborative lesson plan with their team or colleagues to meet the needs of all students.

District/Statewide Discussions of Curriculum

The State Board of Education has adopted a new Science Curriculum Framework as of January 31, 2017. Currently publishers may begin submitting and recommending their new instructional materials that will then be available to districts to adopt and distribute amongst their schools. The estimated release date of new instructional materials being made available is early 2019 ("NGSS Frequently Asked Questions- Science," 2018, no. 22). In the meantime, administrators are doing their best to collect resources for educators to use in the classroom and become slightly familiar with the new standards.

NGSS in the Classroom

There is an extremely visible pattern when it comes to NGSS in the classroom which that is the overwhelming need for curriculum to align to NGSS. Since I have established that this will continue to be a need for another couple of school years, we are lead to ask the question, what resources can I utilize right now? How are some schools implementing the standards in their own classrooms? After doing much research, it has become clear that many educators have taken to the challenge of using their creativity and their understanding of the NGSS in order to create engaging units for their students. From those educators that took the initiative, they have generously shared some with the world via internet. There are many sites such as teacherspayteachers.com, betterlesson.com, and hundreds of others that share multiple lesson plans, but you must keep in mind that these are not state approved to completely align with NGSS. There are also multiple organizations who have created instructional materials that align with NGSS, but again have not been acknowledged as being fully aligned to NGSS. Although these resources are not "approved," they are better than nothing and we as educators have the freedom to adapt or modify these lessons to fit our classroom needs.

California Elementary School

California Elementary School is the site that I currently teach. I did my student teaching with 5th grade at this site in Spring 2015 and they have continued to use the same science curriculum which is *California Science* by Macmillan/McGraw-Hill since before then. I am uncertain how long exactly the West Covina Unified School District (WCUSD) has been using this particular curriculum; however, it was published in 2001. Our students are learning 17-year old information in a world that is dramatically changing in science discoveries, technology, and engineering on a daily basis.

This curriculum was chosen because it met the previous California Science Content Standards expectations and was believed by WCUSD to set our students up for success on the state test. Unfortunately, it does not align with CCSS and does not encourage integration of additional subjects or content areas. Students are given a textbook and in previous years were given an interactive textbook before last school year. WCUSD has decided against the interactive workbook for the last two school years. The textbook may meet the previous standards; however, it contains surface material, lacking any depth of any one concept or idea.

When comparing the standards and content being covered in the 5th-grade science textbook with the new NGSS, it matches only one entire chapter and parts of four chapters out of a total eight chapters. There are multiple chapters and lessons in the book that are not part of 5th grade NGSS standards as well as multiple standards that are not being met of the NGSS standards. From the standards to the current curriculum, there are many gaps and holes that cannot be filled without the proper understanding of the new NGSS as well as taking time to be creative to create a three-dimensional learning experience. Instead, educators are currently challenged to adapt the current curriculum to align with NGSS as best as they can and to create their own lesson plans and/or units where there is no curriculum to align.

When asked about the future of our science curriculum, WCUSD has had no comment, mainly because there is no curriculum released at the moment. However, many teachers do not know that, so the district has been perceived by many as unmotivated in that area. While we wait for curriculum, the district has offered a very brief NGSS professional development at the beginning of the school year, but only to 5th grade teachers and it was a 2 hour program. We were given a task and proceeded with the exploration, discovery, and creation model that NGSS promotes, but it did not help us to understand the standards better, how to read the standards and the three dimensions, or how to create a lesson based off the standard and three dimensions. The PD did not meet the needs of the teachers that attended, and most definitely did not meet the needs of the other grade level teachers who were not present, but are still expected to teach these standards throughout the year.

Concluding Thoughts

In conclusion, NGSS is a set of standards that are unfamiliar to all educators. Some have dipped their toes in further than others to attempt to understand how to implement them, but the fact is that every child, regardless of their teacher's effort taken in dissecting the standards and framework, will be tested on the CAST field test without any approved materials available. Although the results of student performance on the standards will not be made available this school year, students are being set up for failure because of the lack of support and materials for educators. Beginning next school year 2018-2019, students' results will be measured and they will still not have any curriculum ready until the following school year. Because of this, students are being defeated by standards that are not easily accessible for teachers to teach. A successful curriculum must include grade level content that merges NGSS and California Common Core State Standards as a tool for teachers to present to their students to ensure their success on the CAST.

CHAPTER 3

Methods

The new NGSS revolves around the idea of a more hands-on approach. Allowing students to develop their own understanding of the concept or phenomenon through exploration, investigation, and inquiry is scientifically proven to be a more efficient way for students to learn and retain science information. Unfortunately, there is no curriculum to help guide teachers in creating lesson plans to integrate the unfamiliar NGSS and the three dimensions of learning that are attached to each PE. Therefore, I created this product to address this temporary problem and to make a temporary solution while educators in California wait patiently for a new and approved curriculum.

Target Population

This template was designed for my fifth-grade level team in order to help guide us to create effective lesson plans and units to fulfill NGSS in the classroom without curriculum. I would like to further extend it to any and all grade level educators teaching NGSS. I developed a sample unit for teachers to perform in their fifth-grade classrooms in order to gain a visual understanding of how to teach the three dimensions that will result in students' proficiency in the PE. Until we receive proper curriculum approved by the state and NGSS, we have to find creative ways to teach the standards while integrating the three-dimensional learning techniques. This template will help to lead teachers in the right direction while creating a sense of comfort and ease despite the unfamiliarity of the standards.

Materials

There is currently no approved curriculum to help guide educators on how to teach this unique set of standards; however, we are still expected to begin teaching the standards, and students are expected to learn them. Many educators, including myself, have not had the necessary training required to efficiently implement the new teaching strategies that come with NGSS in our classrooms. Although in the present school year fifth graders are field testing the CAST, which means that there will be no performance results released, beginning next 2018-2019 school year, students will begin taking the CAST test and receiving performance results. This is a problem because curriculum will still not yet be available in the classrooms.

The materials that I use to create this template and sample unit are various resources available online. I would search for NGSS 5th grade activities, or specifically the content of an activity on Pinterest or YouTube. Fortunately, I work in a profession where it is encouraged to share your creations such as lesson plans, ideas, activities, etc. so it was not too difficult to locate multiple experiments, investigations, and activities. Although the NGSS are relatively new and extremely foreign to most educators, there are many educators who are extremely familiar with the standards and have produced some exciting examples of how to teach NGSS. The NSTA has multiple lessons available for each PE by various sources that they have put in one spot for you to view.

It is nice—and sometimes overwhelming—to have so much freedom to create whatever kind of lesson we want, but to see the ideas that are available created an excitement in me that I hadn’t had towards NGSS before.

Procedures

I began by thinking about what all teachers could use in order to help guide them through teaching an NGSS unit. My goal was to create something that any teacher could take and fill in regardless of grade level and/or standard. A template that can be changed and altered in any way to fit the needs of all classrooms is my vision. Anyone can add, take away, change, or modify any aspect of the template to fit their unique needs.

I started developing this template by beginning with creating a sample unit to think through how I would use it in my classroom. I decided the best way to organize my template would be through the use of a table dividing columns by the sequence of days to perform certain activities, the activity itself, a detailed explanation describing that activity, what the teacher does, and what the students do.

In the days column, teachers are able to plan out the sequence of their unit and estimate how many days total to complete it. In the sample units, I broke each section up based on my estimation of how much my students could finish in 40-minute lessons. They also don't have to be taught in consecutive days. It is at full discretion of the teacher.

In the activity column, this is just meant to title the type of activity that will be taking place. It gives a nice routine feel to each sample unit, allowing the teacher to recognize what type of investigation or process will be worked on next.

In the description column, teachers are able to identify what standards are being met in this particular section of the unit, as well as which of the 3 dimensions of learning is being used as well.

In the teacher does section, this is where teachers are able to view their role and responsibilities for the lesson. It gives a description of what materials need to be provided by the teacher and how to let students know the expectations.

In the student does section, this is where teachers are able to view what the students' role is and the process that they take to meet the expectations of the teacher.

I found all of my resources online through journals, articles, webinars, and websites ranging from NGSS, NSTA, and teacher sharing sites. I identified a couple of ideas and molded them together while adding my own ideas to create eight 5^{th}-grade sample units with summative assessments.

Descriptions of Units

Performance Expectation. As a teacher, you know that you need a goal or an objective to work around in order to create an effective unit. The same goes with NGSS standards, in this case they are called Performance Expectations (PE). PE's contain 3 types of information in their sentence. The verb at the beginning describes the Science and Engineering Practices (SEP) dimension. This is what they will need to be able to do in order to show proficiency by the summative assessment. The middle section describes the how, when, or where they are going to accomplish the SEP through the Crosscutting Concept (CC) which links multiple domains of science together. The last section describes the Disciplinary Core Ideas (DCI), which is the content or phenomenon that students are learning about in the unit. They should have some slight background on this concept, but should be building on that knowledge with an even deeper understanding by the end of the unit. Every PE is structured the same, but of course offers different objectives.

In the teacher column, next to PE, teachers should divide students into investigation groups of preferably no more than 4 students. Investigation groups make up the unit groups with which students will do collaboration, exploration, investigation, and inquiry. The way that the teacher creates the groups is up to them, whichever way will best fit their students and their classrooms. Some suggestions are by mixed abilities—high, medium, medium, and low-level students mixed in groups to promote learning through classmates, strategic behavior—students that you know will work best with others to create the most comfortable and encouraging learning environment, random—using equity sticks or a similar tool, choose random students to work together to have a variety of mixed groups, or student's choice—allow students to take responsibility of their education by encouraging them to choose their group that they believe they will work with best. I say no more than 4 students because in my own classroom. I have noticed any larger of a group, there is one or more students without any job or part to play and he/she ends up getting off task, and if you have too small of a group, there are not enough thinking minds to discuss and collaborate on their observations and pre-existing knowledge to share.

Teachers may also choose to assign different jobs to each student so that each student has a specific responsibility during the process. Some job positions could be facilitator- the leader of the group to make sure that everyone is on task and to progress through the lessons while making sure that every member is participating, time keeper- the person watching the clock for the time allotted by the teacher and helps to keep everyone on task, scribe- writes down everything being discussed or investigated in the group (every student has their notebook that they will be keeping track of data, but the scribe will have more thorough and detailed notes), and affirmer- acknowledges and supports all thoughts, ideas, inquiries, and answers to build self-esteem and to encourage participation.

Materials Needed. I have provided a row in the template with space for all of the materials needed in order to complete the unit found in the Product. It is organized by the columns for both the teacher and the students. I made sure that the materials stayed consistent in the template by allowing teachers to see what materials they need for instruction and what materials students need for investigation. Having a space before the unit description for a quick view of all materials needed for the unit can be helpful for anyone that uses this sample unit and/or template. Each item is labeled by the number of day that it is needed. If there is no label next to it, that means that it is required for every lesson.

All of the resource materials were found through a mixture of online journals, articles, webinars, and websites ranging from NGSS, NSTA, and teacher sharing sites. I flagged multiple experiments that I liked, chose the ones that worked best with my classroom, and modified each one to meet the needs of my students, school, and myself.

Developing Investigation. The first day of the unit, students will begin with an anticipatory activity. This should be some type of demonstration or video that students can observe to get their minds thinking about the phenomenon that they will be working with for the upcoming unit.

After they observe the developing investigation, students are asked to gather in their groups to collaborate and discuss their observations and thoughts. This can be very difficult for some students. Some may be too shy to share a wrong answer while others may be too overpowering with wanting to share their ideas. It is extremely important to practice collaboration and discussion before beginning these units, perhaps through using sentence frames to start them out. You have to scaffold the skill through getting-to-know you activities at the beginning of the school year or through discussing a common story that everyone can feel comfortable in participating. It is also important to create a nonjudgmental and friendly classroom environment for students to feel safe when sharing vulnerable thoughts, so they know they will not be looked down upon for sharing. It is imperative that every child participates, and that they help challenge each other to develop that deeper thinking and understanding.

Investigation Board. After students have collaborated with their groups, the teacher will pass out multiple index cards to each investigation group and ask them to write down 3-4 inquiry questions that they have. There are no "right" or "wrong" thoughts or questions as long as they are on topic. The teacher should make it known that these inquiry questions are the driving questions that will lead students in their experiments to develop understanding of the phenomenon. These questions in each unit will be referred to at every stage of the lessons. These are meant to keep students focused on the developing investigation and display their learning as they acquire more knowledge throughout the unit

With these inquiry questions on index cards, the teacher will be posted by the teacher on an investigation board. Their location will be determined by the teacher, but can be anywhere around the classroom, such as a wall, a poster board, or maybe creating a digital board on Google Drive. Anywhere for students to always have access to their inquiry questions to help them with their next steps. Separate the board by investigation groups so that each group is only working toward their own inquiry questions. This will be updated daily as they discover answers to their inquiry questions and deepen their understanding of the phenomenon.

Conduct Experiment #1. Each first experiment is getting students to dip their toes into the DCI. This should be something that is similar to the developing investigation for students to perform the phenomenon first-hand. This experiment will require teacher facilitation through performing certain steps, learning how to use certain tools, and to always continue the discussion of lab safety. Students will conduct a type of experiment that will require them to develop or create something.

Record Data. During the conducting of the experiment, students will gather and collect data through a variety of ways such as measuring distance or weight. This section specifies the expectations of what students need to do in order to collect it.

Identify Patterns. In this section, students will be required to create a visual representation of their data collected in the last section in order to analyze and observe the data in an organized manner. This could be through the creation of a chart, graph, bubble map, etc. Students will continue working in their investigation groups to talk through the data together and identify any similar outcomes or patterns of data from the experiment.

Reading Component. NGSS has mapped out the PE with the three dimensions of learning when you visit the standard. Underneath that, it also provides you with the

Common Core State Standards (CCSS) that could also be met in the unit. In my sample units, I chose to implement a reading program that my district uses called Achieve 3000. This program meets numerous CCSS while giving each student differentiated learning through independent Lexile scores. Every student can read the same article at their personal reading level. That opens the door for all learning level students to discuss the same article and to learn the same content at the own learning level. From this program, I can search whatever article topic I want, assign it to students, they will read the article, answer 8 comprehension questions, and answer 1 short answer thought question. When they have completed the assignment, investigation groups can regroup and discuss what they learned from the article and how it connects to the developing investigation and the experiment.

If your site does not have Achieve 3000, there are multiple reading websites such as NewsELA and ReadWorks that offer articles that talk about different NGSS standard DCIs.

Conduct Experiment #2. Next, students will take the knowledge that they have gathered thus far from the developing investigations, experiment, and reading component to try to make sense of the phenomenon. This should be a little less teacher led other than the instruction of the steps needed to conduct the experiment. Students should be familiar enough with the previous experiment and have a better grasp of the concept to work more as a group.

The purpose of this second experiment is to give students one last opportunity to develop connections with a higher-level difficulty project. They will continue working with their investigation groups to conduct the experiment, record accurate data, and identify patterns together.

Explanation of the Phenomenon. Now that students have completed 2 experiments on their own and have developed a pretty good understanding about the phenomenon through inquiry, investigation, exploration, experimentation, collection and representation of data, and collaboration, it is time for the teacher to share the rest of the explanation that students may or may not have grasped in the process. They are familiar with how it works on the surface, but perhaps not on a deeper level of understanding. This is the lecture portion of the unit; however, teachers could use it as a whole class discuss filling in the blanks as they ask students why something happened, while referring back to the experiments performed. Here the teacher will address the DCI dimension of the PE. Through this process, they will allow students to draw on any portion of the unit to connect with the additional information being presented by the teacher in order to develop a deeper understanding of the phenomenon. The teacher will know what information to delve deeper to by looking the remaining questions left on the investigation board. These will be unanswered questions from the unit that students were unable to build a connection to and will therefore be addressed by the teacher.

Lastly, investigation groups should return to the investigation board one final time to answer any unanswered inquiry questions that were left. The teachers could choose to do this whole class if they choose, or allow groups to do it on their own. The idea is that the understanding of this phenomenon should be understood by all, leaving no inquiry question unanswered because they all are scientific experts (in their grade level) in the understanding of the phenomenon.

Summative Assessment. Students have conducted a series of experiments all while exploring one phenomenon driven by their original inquiry questions. Now that students have developed the understanding through multiple dimensions, students must be assessed to determine if their understanding is proficient for the grade level. The summative assessment needs to mirror the PE that it is fulfilling. If the PE says "Conduct and experiment," then students must conduct an experiment on their own, in pairs, or in groups. If the PE says, "Develop a model," then students must develop a model.

Through this template and the 8 5^{th} grade sample units, NGSS and CCSS are cohesively joined together to get any teacher comfortable and motivated to bring this into their classroom.

CHAPTER 4

The main purpose of this project was to create a template that could be used among all fifth-grade teachers providing them with a guide to teach the NGSS and the three dimensions in order to set our students up for success on the CAST. Students will be tested on NGSS on the CAST in the Spring this school year and next school year without any approved curriculum available to districts. I also created eight sample units ranging in all domains so that educators had an example of how to teach the three dimensions required by NGSS and to become familiar with the new teaching and learning strategies expected by both the teacher and the students.

Limitations

Although I created an adaptable template that can be used by all educators teaching NGSS, not only in fifth grade, and eight sample units that will be beneficial to use as an example for all NGSS standards, there are some weaknesses to the project.

While my template can be used for any grade level for NGSS, it could still be perceived with similar reactions as if there was no template at all. NGSS requires teachers to change the way they teach science. Without the complete understanding of the new standards and how to incorporate the three dimensions and Common Core State Standards, I fear that teachers may look at my template and still feel overwhelmed with where to start.

I created eight sample units to give a clear description on the new roles in which a teacher teaches science and the students learn science. The units succeed in that goal; however, they do not represent units usable by all grade levels. It may only be used in a fifth-grade classroom. Luckily, teachers from other grade levels may take the ideas that I provided in the sample unit to help create their own unit in the same domain.

The units that I created benefit fifth grade classrooms for the 8 different Performance Expectations that I provided. This is only eight substandard out of the multiple standards. Fifth grade teachers are still left to create the large majority of their own units to meet all NGSS standards for the school year.

My project is a solution to a temporary problem. I am currently teaching my second year in fifth grade and this has been a problem since NGSS was adopted by the state of California, a few years before I became a teacher. We are in need of approved curriculum by the state and NGSS; however, no curriculum is expected to be released until the beginning of 2019. That is still leaves another school year without the proper materials needed in order to teach our students efficiently, and yet they will begin operational testing in Spring 2019.

Conclusion

This project was designed to help teachers feel more comfortable with creating and teaching an NGSS unit without any curriculum to guide them. I wanted to find a way to benefit all educators teaching NGSS regardless of their grade level and to provide them with a solid example of the NGSS expectations. The sample units allow fifth grade teachers an opportunity to practice with their classrooms, while the template allows all other grade levels a guide to help them with creating their own units. The units promote exploration, investigation, inquiry, and collaboration to support learning. As teachers learn to use my template, students will begin to gain a deeper understanding of NGSS content while integrating CCSS and therefore will perform better on the CAST in Spring.

Recommendations

It has never been more apparent to me than now what role curriculum plays in a teacher's life, especially an elementary teacher who does not have the time to spend on focusing on one subject, when they are required to teach up to 5 subjects daily. It is important that teachers feel supported, when it comes to new standards such as the drastically unique NGSS. These standards are unlike any set of standards that educators, new and seasoned, have ever been exposed to in their careers. They require a new mindset for the teacher and students in the way that science is taught and learned.

When learning about the standards themselves, the techniques that NGSS are promoting make the standards desirable and personally made me feel excited to teach them. However, when looking at the standards and the three dimensions that go with each PE, it becomes overwhelming, because there is so much information and without the proper research or training, knowing where to start can seem like an enormous burden.

Teachers encourage lifelong learning in students. With that being said, teachers should be the example and continue to be lifelong learners as well. In this case, I believe teachers need to educate themselves on these standards, if their districts are not providing the necessary training that is desperately needed. Teachers need to take the initiative and learn about the standards and how to properly execute NGSS lessons in the classroom to set their students up for success. It does no one any good to be scared and wait for proper materials. Our students need to be educated on these standards now, with or without approved curriculum. Teachers do not need to reinvent the wheel either. At the moment there are multiple resources that teach to NGSS, including this project. I recommend that teachers take the time to become familiar with these standards because they will not be going away. This is the present and future of our science expectations, and the sooner all educators are on board, the more successful our students will become in a vastly growing STEM career world.

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PRODUCT

NGSS SCIENCE UNIT TEMPLATE AND SAMPLE UNITS

By Kelsey D. Cooper

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Introduction

The recently adopted NGSS standards are unfamiliar to the majority of educators, yet educators teaching in the states that have adopted them are being required to teach based on the new standards with little or no training on how to read them or how to implement them. The structure of these standards are unlike any other standards before, making educators feel overwhelmed and unsuccessful in their attempts to effectively create lesson plans toward the PEs while integrating the three dimensions required by the standards. The desperate need for curriculum to help guide and drive instruction are currently nonexistent, which means that educators need to pull together whatever resources necessary to align existing curriculum, online supplemental materials, and their own creativity to begin the process. Students are participating in the CAST field test in the Spring of 2018, and will begin fully implementing testing on the CAST in Spring 2019, all before approved curriculum has been released.

Fifth-grade teachers could use this template to help guide them in effectively creating a lesson or unit on any NGSS standard while implementing the three dimensions. It will allow and encourage teachers to use their own creativity and experience, while structuring their lesson plans. Teachers can implement the sample unit in their own 5th-grade classrooms to help them see how an NGSS unit can look like in the classroom and to use as an example for their following units.

I wrote this product, because I wanted to know more about NGSS and how to implement them effectively. I wanted to have an adequate understanding of how to read the standards and integrate the three dimensions in my lessons. I am a 5th-grade teacher; therefore, I am responsible for preparing my students for the CAST test and want my students to be as ready as possible in the Spring. I wanted to create a template that my team and I could use to effectively teach our students to prepare them for the CAST.

With this project, I have created a template for teachers to follow for all NGSS standards in all grade levels and I have included a series of eight sample units for 5th-grade science ranging in all domains.

Table 1

This is a blank template that is usable by all teachers, regardless of what grade level they teach. It is organized by the day of sequence that the lessons will be taught, the description of standards and/or dimensions of learning that are being met in that section of the unit, and what the teachers and students do at each part of the unit lessons. This guides teachers through the planning process by breaking apart lesson routines that scaffolds student learning. This template can be altered and changed to fit any teacher's unique needs.

NGSS Science Unit Template

Day		Description	Teachers Do	Students Do
	Performance Expectation			
	Materials Needed for Unit			
	Developing Investigation			
	Investigation Board			

	Conduct Experiment			
	Record Data			
	Identify Patterns			
	Reading Component			
	Conduct Experiment			
	Explanation of the Phenomenon			
	Summative Assessment			

Table 2

This unit is the first unit in a series of four that meets the standard 5-PS1 *Matter and Its Interactions*. The Performance Expectation (PE) of this unit is for students to develop a model to describe that matter is made of particles too small to be seen. Students will participate in an introductory investigation, conduct 2 experiments, connect their observations with a reading component, and complete a summative assessment demonstrating their understanding of the Disciplinary Core Idea (DCI) that matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made for matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.

5th Grade Physical Science Unit #1

Day		Description	Teachers Do	Students Do
	Performance Expectation	5-PS1-1: Develop a model to describe that matter is made of particles too small to be seen.	Divide students into investigation groups of 4.	
	Materials Needed for Unit		(1) 1 cupcake per group (1) Plastic utensil Investigation Board (1) Index Cards (2) 1 balloon per student (4) 2 clear cups filled with water (4) 1 tbsp. soil (4) 1 tbsp. salt	Pencil/pen Scientist Notebook Technology Device Achieve 3000 (3) Poster Paper

			(4) 1 Stirrer per group (4) Scale	
1	**Developing Investigation**	Students will begin the unit with a brief activity that encourages them to think about matter particles and how they are structured.	Provide each investigation group with a cupcake and a plastic utensil. Instruct students to discuss with their group how this cupcake represents matter and its particles. What can you do with it? How can you change it? How much can you change it? Next, tell them to perform whatever changing actions agreed by the group. *Remind them they only get 1 cupcake	Collaborate with investigation group to discuss what matter is and how matter's particles are represented in this cupcake. Explore how you can change it and how much you can change it by performing actions.
1	**Investigation Board**	A wall/board or digital board would meet the needs in the classroom.	Identify where the investigation board will be. Provide investigation groups with index cards to write down what they know about matter and any inquiry questions they have.	Students discuss with their investigation group members and draw a circle map representing information that they know about matter and what occurred with their cupcake. They will also develop 3 or 4 inquiry questions about Matter (these will be the driving questions for the unit) and post them on the index cards provided by the teacher.

2	**Conduct Experiment**	This experiment should be something that will encourage students to develop an understanding of the structure and properties of Matter.	Distribute a balloon to each student. Instruct them to work in their investigation groups and use their balloons to discuss and answer a series of questions: How are matter particles structured? What do they look like? What can be done to them? How can they be manipulated? What do the particles look like after manipulation?	Each student will be given a balloon. They will work with their investigation groups to collaborate about how Matter particles are structured, what they look like, what can be done to them, how they can be manipulated, and what the particles look like after manipulation using their balloons.
2	**Record Data**		Instruct students to use their imagination using their balloon. Manipulate or change it however you think to. Tell student to record what they do and how it responds or looks.	Students will use their creativity to manipulate the particles of Matter however they choose. They will document their manipulations and their outcomes.
3	**Identify Patterns**	SEP- Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Use models to describe phenomena.	Instruct students to collaborate with their groups to discuss the manipulations and outcomes in their data recordings. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	Students will gather in their groups to discuss observations and conclusions that can be drawn off of the balloon experiment. They will work together to develop a drawing or illustration on poster paper of at least 3 of their observations and

		MP.4- Model with mathematics.		what is happening to the particles of Matter. Refer to Investigation Board for any questions that can be answered.
3	**Reading Component**	Achieve 3000 article "For the Love of Legos" RI.5.1- Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.	Assign the article on Achieve 3000. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	On a technology device (Chromebook or iPad) students independently read the same article at their independent Lexile level. They will answer 8 comprehension questions and 1 short answer prompt. Gather into investigation groups and refer to Investigation Board for any inquiry questions that can be answered.
4	**Conduct Experiment**	Students will build on their knowledge of matter from the past couple of experiments to deepen their understanding of matter particles and their structures. CC- Scale, proportion, and quantity- natural objects exist from	Distribute 2 clear cups filled with water to every investigation group, along with a tablespoon of soil, a tablespoon of salt and a stirrer. Instruct students to use their scales to weigh each item before beginning the experiment. Next, instruct them	Students will weigh each item and record their data. Next, students will mix soil into 1 cup of water and salt into the other, creating 2 new mixtures. They will collaborate with their groups to make observations and draw new conclusions. They

		the very small to the immensely large.	to make two separate mixtures, one containing water and soil, and the other containing water and salt. Encourage them to collaborate with their groups to make observations and draw new conclusions. *Prompt students to re-weigh their mixtures if they don't on their own. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	will develop a drawing or illustration on poster paper to model the matter particles that can and can't be seen. Refer to Investigation Board for any questions that can be answered.
5	**Explanation of the Phenomenon**	DCI- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made for matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or	Call on groups to share their conclusions drawn from the past few experiments. Expand on the DCI for full understanding of the phenomenon presented to them in this unit. Discuss remaining inquiry questions on the investigation board.	Share conclusions drawn from the past few experiments. Share any answers from the inquiry board. Develop a deeper understanding of the phenomenon based on additional information presented by the teacher.

		objects. CC- Natural objects exist from the very small to the immensely large.		
6	**Summative Assessment**	This assessment will be a group project and presentation.	Instruct students to develop a model to describe that matter is made of particles too small to be seen using only items in the classroom (ex. basketball). They will also create a presentation for the class that uses their model to describe matter's structure and properties.	Students will continue working with their investigation groups to find an object(s) in the classroom that they can use to help prove that matter is made of particles too small to be seen. Then, they must create a short presentation that describes in detail their conclusion of matter's structure and properties based on their model.

Table 3

This unit is the second unit in a series of four that meets the standard 5-PS1 *Matter and Its Interactions*. The PE of this unit is for students to measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. Students will participate in an introductory investigation, conduct 2 experiments, connect their observations with a reading component, and complete a summative assessment demonstrating their understanding of the DCI that the amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.

5th Grade Physical Science Unit #2

Day		Description	Teachers Do	Students Do
	Performance Expectation	5-PS1-2: Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.	Divide students into investigation groups of 4.	
	Materials Needed for Unit		(1) 1 cookie (1, 2) Scale (1) Whiteboard Investigation Board (1) Index Cards (2) 2 Beakers per group (5) 1 Beaker per group (5) 1 tbsp. sugar (4) 1 lemon slice	Pencil/pen Scientist Notebook Technology Device Achieve 3000 (2) Water (2) Heat Source (2) Cooling Source (4) Poster Paper (4) Markers

			(7) 1 Beaker (7) 1 cup of juice (7) 2 berries	
1	**Developing Investigation**		You have 1 cookie. Weigh it on a scale and record it on the whiteboard (or somewhere visible to students). Break cookie into 3-5 pieces and ask students to predict what is going to happen to the weight of the broken cookie and crumbles. Next, weigh the pieces of cookie and crumbles on a scale and record it on the whiteboard.	Students carefully watch the teacher's demonstration of weighing the cookie, breaking the cookie, and reweighing the cookie and crumbles. They will write down observations, predictions, and inquiries throughout the demonstration.
2	**Investigation Board**	A wall/board or digital board would meet the needs in the classroom.	Identify where the investigation board will be. Instruct students to share their observations, predictions, and inquiries with their groups. Discuss whether their predictions were right or wrong and brainstorm why. Provide investigation groups with index cards to write down their inquiry questions.	Students share their observations, predictions, and inquiries with their investigation groups. They will discuss possible reasons why their predictions were right or wrong in reference to particles of matter and their structures. They will develop 3-4 inquiry questions on index cards to post on the investigation board (these will be the driving questions for the unit).

2-3	**Conduct Experiment**	SEP- Mathematical and computational thinking in 3-5 builds on K-2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. Standard units are used to measure and describe physical quantities such as eight, time, temperature and volume.	Distribute 2 beakers labelled A and B to each group. Have scales out for use. Facilitate and prompt students for next steps, deeper understandings, and making connections. Instruct students to in the weight of matter per item and then predict the total weight of matter of the mixture.	Each investigation group is given 2 beakers, labelled A and B. They will weigh their empty beakers first, then fill their beakers with water and weigh their beakers separately. Next, students will add an element to each beaker and document the results in their scientist notebook. On beaker A, students will use a heat source (hair dryer or no heat melts warmer), then they will weigh it and record the results. On beaker B, students will use a cooling source (freezer-will take overnight to get results), then they will weigh it and record the results.
3	**Record Data**		Instruct students to organize each weight and total. Help groups with subtracting the difference of the matter of water and beaker.	Students begin by recording the weight of the beakers alone. Next, they record the water weight and subtract the weight of the beaker to find the weight of just the water. Then, students will add a heat element to beaker A and a

				cooling element to beaker B and reweigh each beaker and record the results.
4	**Identify Patterns**		Instruct students to represent their data collected using a bar graph. Circulate the room and help groups struggling with how to organize their bar graph. Provide poster paper and markers for students to use. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	Students will take the data recorded and create a 4 column bar graph representing beaker A before and after the element of heat and beaker B before and after the element of cold. They will create a graph on poster paper to represent their data. Students will identify patterns from both their first conducted experiment and the initial cookie demonstration. Refer to Investigation Board for any questions that can be answered.
4	**Reading Component**	Achieve 3000 article "Got Goat's Milk? Make Ice Cream!" RI.5.1- Quote accurately from a text when explaining what the text says explicitly and when drawing	Assign the article on Achieve 3000. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	On a technology device (Chromebook or iPad) students independently read the same article at their independent Lexile level. They will answer 8 comprehension questions and 1

		inferences from the text.		short answer prompt. Gather into investigation groups and refer to Investigation Board for any inquiry questions that can be answered.
5-6	**Conduct Experiment**		Distribute 1 beaker to each group. Instruct students to find the weight of water, the lemon slice, and sugar. Next, tell students to combine and create a mixture. Tell them to find the total weight of matter of the mixture. Facilitate and prompt students for next steps, deeper understandings, and making connections. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	Students will be given a beaker per investigation group. They will weigh the beaker and record the data. Next, they will fill the beaker halfway with water and weigh the beaker. They will need to subtract the beaker weight from the total weight to find the weight of the water. Then, each group will be provided with a lemon slice and 1 tbsp. of sugar. Students need to weight each item individually and record data. Next, students will mix all three ingredients in the beaker and weigh the total. From the data collected, investigation groups will create a bar graph that represents their data and identify any patterns from the

				graph. Refer to Investigation Board for any questions that can be answered.
6	**Explanation of the Phenomenon**	DCI- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. No matter what reaction or change in properties occurs, the total weight of the substances does not change. Science assumes consistent patterns in natural systems.	Call on groups to share their conclusions drawn from the past few experiments. Expand on the DCI for full understanding of the phenomenon presented to them in this unit. Discuss remaining inquiry questions on the investigation board.	Share conclusions drawn from the past few experiments. Share any answers from the inquiry board. Develop a deeper understanding of the phenomenon based on additional information presented by the teacher.
7	**Summative Assessment**		Divide students into pairs. Distribute 1 beaker, 1 cup of juice, and 2 berries to each pair. Tell them to measure and graph the ingredients and final mixture to prove that the total weight of matter is conserved.	Students will work in pairs. Each pair will be given a beaker, 1 cup of juice, and 2 berries. Students will recreate the previous experiments to measure each ingredient individually, then create a mixture and measure the total.

				They will graph the quantities and in a written response, provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substance, the total weight of matter is conserved.

Table 4

This unit is the third unit in a series of four that meets the standard 5-PS1 *Matter and Its Interactions*. The PE of this unit is for students to make observations and measurements to identify materials based on their properties. Students will participate in an introductory investigation, conduct 2 experiments, connect their observations with a reading component, and complete a summative assessment demonstrating their understanding of the DCI that measurements of a variety of properties can be used to identify materials.

5th Grade Physical Science Unit #3

Day		Description	Teachers Do	Students Do
	Performance Expectation	5-PS1-3: Make observations and measurements to identify materials based on their properties.	Divide students into investigation groups of 4.	
	Materials Needed for Unit		(1) Kool-Aid powder (1) Salt Investigation Board (1) Index Cards (2) flour (2) cinnamon (2) garlic salt (4) copper (4) granite (4) foil (4) rock (6) water (6) vinegar (6) apple cider vinegar	Pencil/pen Scientist Notebook Technology Device Achieve 3000 (2, 4) magnet (2, 4) scale (2, 4) magnifying glass
1	**Developing**		Distribute unknown	Each investigation

	Investigation		substances (Substance A is Kool-Aid powder and substance B is salt) to each investigation group. Instruct students to list the properties of the substances. Remind students what a property is (weight, color, *taste, texture, size, shape, odor, state, magnetic, etc.) *Tasting unknown substances is NEVER advised for any grade level. Teacher must give the okay first.	group is provided 2 containers containing 1 tbsp. each of a mystery substance labelled A and B. Students will discuss and record what properties each of these substances possess.
1	**Investigation Board**	A wall/board or digital board would meet the needs in the classroom.	Identify where the investigation board will be. Call on groups to share the properties that they identified. Provide investigation groups with index cards to write down their inquiry questions.	Students will create a double bubble map to compare and contrast the properties of Substance A and Substance B. Investigation groups will share their observations and develop 3-4 inquiry questions to write on the index cards to post on the investigation board.
2	**Conduct Experiment**	CC- Standard units are used to measure and describe physical quantities such as weight, time, temperature,	Distribute unknown substances (A is flour, B is cinnamon, and C is garlic salt) to each group.	Investigation groups are provided with 3 mystery substances labelled A, B, and C. They are encouraged to use

		and volume.		the multiple tools available to identify even more properties (magnet, scale, magnifying glass).
2	**Record Data**		Instruct students to create a list for each unknown substance's properties.	Each student will create a chart in their scientist notebooks to organize each item's properties.
3	**Identify Patterns**	W.5.7- Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.	Instruct students to use their research skills to try to identify what the unknown substance is based on its properties. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	Investigation groups will discuss their chart and compare and contrast properties between the 3 substances. Students will conduct research using a technology device to determine the mystery substances based on their properties. Refer to Investigation Board for any questions that can be answered.
3	**Reading Component**	Achieve 3000 article "Found! Huge Gem in North Carolina" RI.5.1- Quote accurately from a text when explaining what the text says explicitly and when drawing	Assign the article on Achieve 3000. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	On a technology device (Chromebook or iPad) students independently read the same article at their independent Lexile level. They will answer 8 comprehension questions and 1

		inferences from the text.		short answer prompt. Gather into investigation groups and refer to Investigation Board for any inquiry questions that can be answered.
4	**Conduct Experiment**	SEP- Planning and carrying out investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and progresses to include investigations that control variable and provide evidence to support explanations or design solutions. Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.	Distribute the unknown items (A is copper, B is granite, C is foil, D is a rock) to each group. Instruct students to create a list for each unknown substance's properties. Instruct students to use their research skills to try to identify what the unknown substance is based on its properties. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	Investigation groups are provided with 4 mystery items labelled A, B, C, and D. They are encouraged to use the multiple tools available to identify even more properties (magnet, scale, magnifying glass). They will create a chart in their scientist notebooks to organize each item's properties. Investigation groups will discuss their chart and compare and contrast properties between the 4 items. Students will conduct research using a technology device to determine the mystery materials based on their properties. Refer to Investigation Board for any questions that can be

				answered.
5	**Explanation of the Phenomenon**	DCI- Measurements of a variety of properties can be used to identify materials.	Call on groups to share their conclusions drawn from the past few experiments. Expand on the DCI for full understanding of the content presented to them in this unit. Discuss remaining inquiry questions on the investigation board.	Share conclusions drawn from the past few experiments. Share any answers from the inquiry board. Develop a deeper understanding of the phenomenon based on additional information presented by the teacher.
6	**Summative Assessment**		Distribute 3 unknown substances (Substance A is water, Substance B is vinegar, and Substance C is apple cider vinegar) to each student.	Each student will be provided 3 mystery items A, B, and C. They will create a 3 column chart to organize each item's properties. Using their data, they will research based on the material's properties to identify what each material is.

Table 5

This unit is the fourth and final unit in the series that meets the standard 5-PS1 *Matter and Its Interactions*. The PE of this unit is for students to conduct an investigation to determine whether the mixing of two or more substances results in new substances. Students will participate in an introductory investigation, conduct 2 experiments, connect their observations with a reading component, and complete a summative assessment demonstrating their understanding of the DCI that when two or more different substances are mixed, a new substance with different properties may be formed.

5th Grade Physical Science Unit #4

Day		Description and Standards	Teachers Do	Students Do
	Performance Expectation	5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	Divide students into investigation groups of 4.	
	Materials Needed for Unit		(1) cake mix (1) eggs (1) oil (1) baked cake Investigation Board (1) Index Cards (2) plastic bottle per group (2) balloon per group (2) 2-3 tbsp. baking soda per group (2) vinegar (4) 15 baggies per group	Pencil/pen Scientist Notebook Technology Device Achieve 3000 (2) funnel (4) 3 eyedroppers

			(4) 2-3 tbsp. baking soda per baggie (4) 2-3 tbsp. cornstarch per baggie (4) 2-3 tbsp. plaster of Paris per baggie (4) 2-3 tbsp. sugar per baggie (4) 2-3 tbsp. salt per baggie (4) water (4) iodine (4) vinegar (6) 1 baggie per pair (6) 1 Alka-Seltzer tablet per pair	
1	**Developing Investigation**		Demonstrate mixing ingredients to make a cake. Pour the mixture into a cake pan and set it to the side. Next, take out a baked cake still in the pan and set it next to the mixture. Ask students to think about the changes that occurred. Review physical change (a reversible action such as changing the state or a property of a substance) and chemical chance (an irreversible action that changes into a completely new substance).	Students carefully watch the teacher's demonstration of mixing ingredients to make a cake (cake mix, eggs, oil, and water). They record any observations that they make and document each step. Next, they listen to the teacher's next steps that will not be done in class- put the mixture in a pan and bake it. They see the teacher pull out a cake. Students are asked to think about the changes that occurred before and after baking.
1	**Investigation Board**	A wall/board or digital board would	Identify where the investigation board	Students discuss with their group

		meet the needs in the classroom.	will be. Provide investigation groups with index cards to write down their inquiry questions.	members and develop 3 or 4 inquiry questions to write on the index cards to post to their investigation board (These will be the driving questions for the unit).
2	**Conduct Experiment**	W.5.7- Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.	Distribute a bottle, a balloon, 2-3 tbsp. of baking soda and a funnel to each group. Have vinegar available by the sink. Walk students step-by-step through this experiment. First, fill the balloon with baking soda using the funnel, then fill the bottle halfway with vinegar. Next, record your predictions of what kind of change is going to occur and share with your group. Next, lift the balloon and watch carefully (balloon will fill with gas).	Each investigation group will be given a bottle and a balloon. Students will put 2-3 tbsp. of baking soda in the balloon using a funnel and fill the bottle up halfway with vinegar. Next, students will carefully stretch the balloon around the rim of the bottle without pouring any of the contents into the bottle. They each will document their own predictions about what kind of change will take place. Then, they will share their predictions with the group and discuss why each of them predicts what they do. Finally, students will lift the balloon dropping the baking soda into the bottle and observe the change.
2	**Record**		Instruct students to	Students will record

	Data		record their observations and determine if their prediction was correct or not.	their observations at each step and record their prediction before the experiment takes place. After, they will record their observations from the experiment and determine if their prediction was correct or not.
3	**Identify Patterns**	CC- Cause and effect relationships are routinely identified and used to explain change.	Instruct groups to collaborate about their observations and thought on why that occurred. Have groups identify what kind of change did occur and to use evidence to explain. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	Students will look at their data and discuss their observations, thoughts, and conclusions drawn from the experiment to determine what type of change occurred in the experiment. Students will explain how they know using evidence. Refer to Investigation Board for any questions that can be answered.
3	**Reading Component**	Achieve 3000 article "Goldman Takes the Cake" RI.5.1- Quote accurately from a text when explaining what the text says explicitly and when drawing	Assign the article on Achieve 3000. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	On a technology device (Chromebook or iPad) students independently read the same article at their independent Lexile level. They will answer 8 comprehension questions and 1

		inferences from the text.		short answer prompt. Gather into investigation groups and refer to Investigation Board for any inquiry questions that can be answered.
4-5	**Conduct Experiment**	SEP- Planning and carrying out investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and progresses to include investigations that control variable and provide evidence to support explanations or design solutions. Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.	Distribute 15 baggies to each group, each labelled with the type of powder that it contains and the number 1, 2, or 3 in the 3 bag per powder series. Instruct students to organize their data by creating a chart in their scientist notebooks. Distribute 3 eye droppers and 3 containers of liquid (water, iodine, and vinegar) to each group. Instruct student to drop 2-3 drops of each liquid into a different bag for each type of powder. Have them record any observations in their chart and identify what type of change occurred (physical or chemical). Baking soda + vinegar = fizz (chemical change),	Each investigation group will be given 3 baggies of each powder (15 baggies total) labelled with the type of powder in the baggie (baking soda, cornstarch, plaster of Paris, sugar, and salt) and the number in the 3 baggies per powder series. Students will create a chart in their scientist notebooks to organize their observations for each baggie. Each group will also be given 3 eyedroppers and 3 containers of liquid (water, iodine, and vinegar). Students will drop 2-3 drops of each substance into a separate bag of each powder and record any observations that occur. Students need to record the cause and effect of mixing 2 substances

			cornstarch + iodine = black (chemical change), plaster of Paris + water = hard (physical change) and warm (chemical change), sugar + heat = brown (chemical), salt + water = dissolve (physical change) Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	together and determine whether the mixing of the 2 substances resulted in a mixture (physical change) or a new substance (chemical change). Refer to Investigation Board for any questions that can be answered.
5	**Explanation of the Phenomenon**	DCI- When two or more different substances are mixed, a new substance with different properties may be formed.	Call on groups to share their conclusions drawn from the past few experiments. Expand on the DCI for full understanding of the phenomenon presented to them in this unit. Discuss remaining inquiry questions on the investigation board.	Share conclusions drawn from the past few experiments. Share any answers from the inquiry board. Develop a deeper understanding of the phenomenon based on additional information presented by the teacher.
6	**Summative Assessment**	W.5.9- Draw evidence from literary or informational texts to support analysis, reflection, and research.	Divide students into pairs. Instruct them to conduct an investigation to determine whether the mixing of 2 or more substances results in a new substance through a	Students will work in pairs to conduct an investigation to determine whether the mixing of 2 or more substances results in new substances. First, students will be

			chemical reaction. Distribute 1 baggie and instruct 1 partner to fill it ¼ of the way full with water. Next, distribute a tablet (Alka-Seltzer) to each group and instruct them to quickly drop the tablet in the baggie and seal it shut. Tell them to record their observations and work with their partner to determine if it is a new substance through chemical change or if it is a mixture through physical change. Instruct them to develop a written explanation of how they came to that conclusion using evidence from the past units and readings.	given a baggie ¼ filled with water and a tablet. Students will drop the tablet in the water and close the baggie quickly to observe the baggie filling with air. Students will record their observations and determine if it is a new substance through chemical change or if it remains a physical change. Students must respond to explain how they came to that conclusion using what they know about particles of matter, properties of matter, and physical and chemical changes.

Table 6

This unit is the only unit in a that meets the standard 5-PS2 *Motion and Stability: Forces and Interactions*. The PE of this unit is for students to support an argument that the gravitational force exerted by Earth on objects is directed down. Students will participate in an introductory investigation, conduct 2 experiments, connect their observations with a reading component, and complete a summative assessment demonstrating their understanding of the DCI that the gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.

5th Grade Physical Science Unit #5

Day		Description	Teachers Do	Students Do
	Performance Expectation	5-PS2-1: Support an argument that the gravitational force exerted by Earth on objects is directed down.	Divide students into investigation groups of 4.	
	Materials Needed for Unit		Investigation Board (1) Index Cards (1) Coins (1) Class materials (2) 1 ball per group (2) 1 paper clip per group (2) 1 piece of paper per group (4) 1 disposable cup per group (6) Writing prompt	Pencil/Pen Scientist Notebook Technology Device Achieve 3000 (4) 1 iPad per group
1	**Developing Investigation**		Teacher demonstrates gravity by dropping multiple items	Students watch teacher demonstration as each item falls.

			(coins, class materials, etc.) from the same spot and height. Instruct students to record any observations.	Students record their observations and inquiries in their scientist notebooks.
1	**Investigation Board**	A wall/board or digital board would meet the needs in the classroom.	Identify where the investigation board will be. Provide investigation groups with index cards to write down their inquiry questions.	Students discuss with their group members and develop 3 or 4 inquiry questions to write on the index cards to post to their investigation board (These will be the driving questions for the unit).
2	**Conduct Experiment**		Instruct groups to find a space outside. For each item, tell them toss, throw, and manipulate it however they wish (appropriately) and by using a variety of forces.	Each investigation group will be given 1 ball, 1 piece of paper, and 1 paper clip. They will go outside to conduct this experiment. Students will take each object and throw in multiple directions and at multiple forces.
2	**Record Data**		Encourage students to take clear and precise notes on the actions that took place and the measurements and outcomes of each trial.	Students will record any data, measurements, and observations made from this experiment in their scientist notebooks.
3	**Identify Patterns**	CC- Cause and effect relationships are routinely identified and used to explain change.	Instruct students to gather in investigation groups to discuss the results of the experiment.	Investigation groups will discuss the cause and effect of each trial throw. They will identify

			Ask them to identify any patterns and to try to build connections to gravity. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	any patterns from the experiment and discuss observations and conclusions drawn from the experiment. Refer to Investigation Board for any questions that can be answered.
3	**Reading Component**	Achieve 3000 article “The Ice Slide” RI.5.1- Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.	Assign the article on Achieve 3000. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	On a technology device (Chromebook or iPad) students independently read the same article at their independent Lexile level. They will answer 8 comprehension questions and 1 short answer prompt. Gather into investigation groups and refer to Investigation Board for any inquiry questions that can be answered.
4	**Conduct Experiment**		Distribute 1 disposable cup to each group. Instruct them to poke a small hole in the side toward the bottom. Next, have students fill the cup while covering the hole with their finger and lead the	Each investigation group will be given a disposable cup. They will poke a hole in the side of the cup with a pen towards the bottom and then fill the cup with water while covering the hole with their finger and

			groups outside. Let the student remove their finger from the hole and have the group record only observations. Then, have the students refill the cup and return outside while another student from the group sets up the iPad to video record the next part. When both students are ready, the student holding the cup will drop the cup. Students will commence back inside to view the recording in slow motion and discuss observations, thoughts, and conclusions. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	go outside. Next, they will remove their finger from the hole and record any observations or inquiries that they have from this step. Then, students will refill the cup and return outside. One student needs to have a recording device (iPad) to record this next experiment. The student filming will tell the student holding the cup when to drop it. After they drop the cup, students will review the recording in slow motion. They will record any observations and inquiries from this step. Next, students will gather to discuss their observations from this experiment and draw any conclusions about the connection of gravity, the water, and the cup. Refer to Investigation Board for any questions that can be answered.
5	**Explanation of the**	DCI- The gravitational force	Call on groups to share their	Share conclusions drawn from the past

	Phenomenon	of Earth acting on an object near Earth's surface pulls that object toward the planet's center.	conclusions drawn from the past few experiments. Expand on the DCI for full understanding of the phenomenon presented to them in this unit. Discuss remaining inquiry questions on the investigation board.	few experiments. Share any answers from the inquiry board. Develop a deeper understanding of the phenomenon based on additional information presented by the teacher.
6	**Summative Assessment**	W.5.1- Write opinion pieces on topics or texts, supporting a point of view with reasons and information.	Present your students with a writing prompt for a persuasive essay that supports the argument that the gravitational force exerted by Earth on objects is directed down. Encourage evidence from the unit.	Students will create an persuasive essay supporting the argument that the gravitational force exerted by Earth on objects is directed down. They will use their experiences from the overall unit to use as evidence to support their claim.

Table 7

This unit is the only unit in a that meets the standard 5-LS1 *From Molecules to Organisms: Structures and Processes*. The PE of this unit is for students to support an argument that plants get the materials they need for growth chiefly from air and water. Students will participate in an introductory investigation, conduct 2 experiments, connect their observations with a reading component, and complete a summative assessment demonstrating their understanding of the DCI that plants acquire their material for growth chiefly from air and water.

5th Grade Life Science Unit #1

Day		Description	Teachers Do	Students Do
	Performance Expectation	5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water.	Divide students into investigation groups of 4.	
	Materials Needed for Unit		Investigation Board (1) Index Cards (2) 5 plastic cups per group (2) 5 bean plants per group (2) soil (13) 2 plastic cups per group (13) 2 bean plants per group (13) juice (13) sand/dirt (25) Writing Prompt	Pencil/Pen Scientist Notebook Technology Device Achieve 3000 (2) 1 iPad per group
1	**Developing Investigation**		Pose this question to every student- What do you need	Students respond to a question given by the teacher about

			to live? Let them ponder that question and answer in their scientist notebooks.	what they need to live. Students record answer in their scientist notebook.
1	**Investigation Board**	A wall/board or digital board would meet the needs in the classroom.	Identify where the investigation board will be. Provide investigation groups with index cards to write down their inquiry questions.	Students discuss with their group members and develop 3 or 4 inquiry questions to post to their investigation board (These will be the driving questions for the unit).
2-12	**Conduct Experiment**	This experiment will go over a course of 2 weeks. Divide materials accordingly to personal availability.	Provide each investigation group with 5 small plastic cups and have students label them A-E. Have instructions posted on the board for students to follow as you cycle around to help. Fill all cups ½ way with soil except cup B that will be filled ½ way with water. Place each bean plant in the soil and cover the roots gently. Place in classroom necessary for the elimination of elements (Plant A will have all elements so place it in a sunny spot with water and fresh air, Plant B will not have soil, Plant C will not have light so place it in a dark	Each investigation group will receive 5 small plastic cups. They will fill each cup except 1 half way with soil. In the empty cup, groups will substitute soil with water. Then, they will place each bean plant in the soil and cover it gently. Next, groups will label their cups and choose 1 element to remove from each plant (soil, light, air, water) and 1 plant will have access to all elements.

			closet or cabinet, Plant D will not have air so place in in an airtight container, and Plant E will not have water so you will not water it for the duration of the experiment).	
2-12	**Record Data**		Instruct students to record beginning measurements and photograph day 1 of plants on the iPads. Continue this process daily for the next 2 weeks.	Students will record data daily by measuring growth, observing change, and documenting actions such as watering. Students will take daily pictures on their iPads to document visual evidence. They will keep their data organized in their scientist notebook.
2-12	**Identify Patterns**	CC- Matter is transported into, out of, and within systems.	Instruct students to analyze their data to identify any patterns that occurred through the duration of the experiment. Encourage groups to discuss what elements plants need to live. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	At the end of 2 weeks, students will analyze their data and identify patterns regarding which elements seem to be the most necessary in plant growth. Groups will collaborate to determine which elements are needed and explain why using their data. Refer to Investigation Board for any questions that can be

				answered.
13	**Reading Component**	Achieve 3000 article "Water These Plants? Maybe Not" RI.5.1- Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.	Assign the article on Achieve 3000. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	On a technology device (Chromebook or iPad) students independently read the same article at their independent Lexile level. They will answer 8 comprehension questions and 1 short answer prompt. Gather into investigation groups and refer to Investigation Board for any inquiry questions that can be answered.
13-23	**Conduct Experiment**		Distribute 2 small plastic cups to each group. Instruct students to find 1-2 substitutes for soil (dirt, sand, grass, paper, etc.) and fill each cup ½ way with a different substitution. Next, tell them to place the bean plant in the substitute soil and cover the roots gently. Have groups collaborate to decide which 2 elements they would like to deprive 1 plant from and substitute with something else in its	Each investigation group will receive 2 small plastic cups. They will fill both half way with a substitute for soil. Next, they will place the plant in the substituted soil and cover it gently. Then, investigation groups will collaborate to decide which 2 elements they would like to try to substitute (ex. juice instead of water, light bulb instead of sunlight) for Plant A. Plant B will have access to both water

			place (ex. juice instead of water, light bulb instead of sunlight). Instruct students to record beginning measurements and photograph day 1 of plants, then have them place the plants in the classroom necessary for the elimination and substitution of elements. Continue this process daily for the next 2 weeks. Instruct students to analyze their data to identify any patterns that occurred throughout the duration of the experiment. Encourage students to collaborate with their groups to decide which elements are essential to plants and to explain why by using evidence from the past experiments. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	and sunlight. Students will collect data over the next 2 weeks by measuring growth, observing change, and documenting actions. Students will take daily pictures on their iPads to document visual evidence. After the 2 weeks are over, students will analyze the data collected and identify any patterns or outcomes that are presented in the data. Students will collaborate over which elements are essential to plants and why using evidence from the past experiments. Refer to Investigation Board for any questions that can be answered.
24	**Explanation of the Phenomenon**	DCI- Plants acquire their material for growth chiefly from air and water.	Call on groups to share their conclusions drawn from the past few	Share conclusions drawn from the past few experiments. Share any answers

			experiments. Expand on the DCI for full understanding of the phenomenon presented to them in this unit. Discuss remaining inquiry questions on the investigation board.	from the inquiry board. Develop a deeper understanding of the phenomenon based on additional information presented by the teacher.
25	**Summative Assessment**	SEP- Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). W.5.1- Write opinion pieces on topics or tests, supporting appoint of view with reasons and information.	Present your students with a writing prompt for a persuasive essay that supports the argument that plants get the materials they need for growth chiefly from air and water, not from the soil. Encourage evidence from the unit.	Students will write a persuasive essay supporting the argument that plants get the materials they need for growth chiefly from air and water, not from the soil. Students will use evidence from their experiments throughout the unit to support their claim.

Table 8

This unit is the first unit in a series of two that meets the standard 5-ESS1 *Earth's Place in the Universe*. The PE of this unit is for students to support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth. Students will participate in an introductory investigation, conduct 2 experiments, connect their observations with a reading component, and complete a summative assessment demonstrating their understanding of the DCI that the sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth.

5th Grade Earth and Space Science Unit #1

Day		Description	Teachers Do	Students Do
	Performance Expectation	5-ESS1-1: Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.	Divide students into investigation groups of 4.	
	Materials Needed for Unit		Investigation Board (1) Index Cards (1) 2 balls the same size (2, 3) 5 sets of lights per group (4) Writing Prompt	Pencil/Pen Scientist Notebook Technology Device Achieve 3000 (2) 1 iPad per group
1	**Developing Investigation**		Place 2 same sized balls on a desk next to each other. Ask students to notice their appearance. Next, take 1 ball and place it 5 feet	Students will record observations in their scientist notebook as the teacher demonstrates. Students notice two balls the same size

			back. Ask students to notice their appearance now. Lastly, take the front ball and move it forward 3 feet. Ask students to notice their appearance now. Have students record their observations in their scientist notebooks. Perhaps encourage them to draw illustrations representing the demonstration.	next to each other. Next, the students observe the teacher move one ball 5 feet back. Students make the observation that although the balls are the same size, one appears bigger because it is close, and the other appears smaller because it is further away. Students observe the teacher move the front ball 3 feet forward. Students make another observation that the bigger ball appears even bigger because it has decreased its distance to them.
1	**Investigation Board**	A wall/board or digital board would meet the needs in the classroom.	Identify where the investigation board will be. Provide investigation groups with index cards to write down their inquiry questions.	Students discuss with their group members and develop 3 or 4 inquiry questions to post to their investigation board (These will be the driving questions for the unit).
2	**Conduct Experiment**		Provide each investigation group with at least 5 sources of the same sized light (flashlights, light strands, lamps, etc.). Encourage students to place them in a variety of orders	Investigation groups will be provided with 5 same sized lights (flashlights, light strands, lamp, etc.). Using these light sources, students will place them in a variety of orders and make

			and make observations on their distance and visibility.	observations on their distance and visibility.
2	**Record Data**		Instruct students to record their data in their scientist notebook and to take pictures on their iPad. Encourage them to organize their data by measuring distance and visibility.	Students will record their data in their scientist notebooks. They will document visual evidence using their iPad. They will organize their data by system of distance and visibility.
2	**Identify Patterns**		Ask students to analyze the data and observations collected to identify patterns and draw conclusions. Have groups collaborate about how distance affects visibility of lights in the classroom. Facilitate discussion to guide them to deeper understanding by connecting this experiment to the sun and stars. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	Using the evidence collected in this experiment, students will identify and draw conclusions based on patterns observed in the data. Students will discuss how distance affects visibility of lights in the classroom and connect that understanding to the sun and stars that are visible and not visible. Refer to Investigation Board for any questions that can be answered.
3	**Reading Component**	Achieve 3000 article "A WISE Find"	Assign the article on Achieve 3000.	On a technology device (Chromebook or

		RI.5.1- Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.	Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	iPad) students independently read the same article at their independent Lexile level. They will answer 8 comprehension questions and 1 short answer prompt. Gather into investigation groups and refer to Investigation Board for any inquiry questions that can be answered.
3	**Conduct Experiment**	CC- Natural objects exist from the very small to the immensely large. MP.4- Model using mathematics	Provide students with multiple lights and instruct them to create a model that represents the sun and stars. Based on the student's location, encourage the connection that their brightness is due to their relative distance from Earth. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	Students will create a model representing the sun and stars that demonstrate that their brightness is due to their relative distance. They will move themselves to observe how their placement determines their view. They can use this observation to draw conclusions based on the sun and stars' brightness and our view from Earth. Refer to Investigation Board for any questions that can be answered.
3	**Explanation**	DCI- The sun is a	Call on groups to	Share conclusions

	of the Phenomenon	star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth.	share their conclusions drawn from the past few experiments. Expand on the DCI for full understanding of the phenomenon presented to them in this unit. Discuss remaining inquiry questions on the investigation board.	drawn from the past few experiments. Share any answers from the inquiry board. Develop a deeper understanding of the phenomenon based on additional information presented by the teacher.
4	**Summative Assessment**	SEP- Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). W.5.1- Write opinion pieces on topics or tests, supporting appoint of view with reasons and information.	Present your students with a writing prompt for a persuasive essay that supports the argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth. Encourage evidence from the unit.	Students will create a persuasive essay that supports the argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth. They will use evidence collected throughout the unit to support their claim.

Table 9

This unit is the second and final unit in a series of two that meets the standard 5-ESS1 *Earth's Place in the Universe*. The PE of this unit is for students to represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. Students will participate in an introductory investigation, conduct 2 experiments, connect their observations with a reading component, and complete a summative assessment demonstrating their understanding of the DCI that the orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.

5th Grade Earth and Space Science Unit #2

Day		**Description**	**Teachers Do**	**Students Do**
	Performance Expectation	5-ESS1-2: Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.	Divide students into investigation groups of 4.	
	Materials Needed for Unit		(1) *Tree Shadows-Time Lapse* YouTube video (1) Projector (1) Index Cards Investigation Board	Pencil Scientist Notebook Technology Device Achieve 3000 Protractor/Ruler Markers

			(3)Butcher paper or Post-it poster paper (4)Ball and flashlight per group (5) *Sun's Shadow Time Lapse* YouTube video (5) Graph paper	(5)Technology Device
1	**Developing Investigation**	SL.5.5 Include multimedia components and visual displays in presentations when appropriate to enhance the development of main ideas or themes	Present students with a brief video (Tree Shadows-Time Lapse). Make video visible to all students using a projector. Play the video at least twice for students to observe multiple details.	Throughout the video, students will make observations and make inquiries about the phenomenon and record them in their scientist notebook.
1	**Investigation Board**	A wall/board or digital board would meet the needs in the classroom.	Identify where the investigation board will be. Provide investigation groups with index cards to write down their inquiry questions.	Students discuss with their group members and develop 3 or 4 inquiry questions to post to their investigation board. (These will be the driving questions for the unit)
2	**Conduct Experiment**		Instruct students to observe an object's shadow at multiple intervals throughout the day for a 24 hour period. Tell them they will measure the shadow (length and angle) through the use of a ruler and/or protractor.	Investigation groups will collaborate to decide which object they will be measuring throughout the course of a day and divide the check-in intervals up amongst the group members.
2-3	**Record**		Tell students that	Students will create

	Data		they need to decide how to split up the intervals and agree on a process to measure and record the data collected so it is consistent.	a schedule that marks each member to their turn to return to the object and collect measurements throughout the 24 hour period. Students will practice measuring together to ensure consistency in their data.
3	**Identify Patterns**	SEP- Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing quantitative approaches to collecting data and conduction multiple trials of qualitative observations. MP.4- Model with mathematics Represent data in graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. CC- Patterns can be used as evidence to support an explanation.	Instruct investigation groups to gather their data and create a graph to represent it. Ask them to analyze the graph and identify any patterns, observations, or thought from the graph. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	Groups will put together all of the data from the investigation and organize it in their scientist notebooks. Next, they will create a graph that will represent the data collected over the last 24 hours. Lastly, students will analyze the graph and identify any patterns and share any observations or thoughts with the group. Refer to Investigation Board for any questions that can be answered.
3	**Reading Component**	Achieve 3000 article	Assign the article on Achieve 3000.	On a technology device

		"A Wonder in the Sky"	Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	(Chromebook or iPad) students independently read the same article at their independent Lexile level. They will answer 8 comprehension questions and 1 short answer prompt. Gather into investigation groups and refer to Investigation Board for any inquiry questions that can be answered.
4	**Conduct Experiment**		Provide each group with a model Earth (ball) and a model sun (flashlight). Challenge students to create a model that will explain your observations and data from the previous investigation. Encourage them to try many times to develop a deeper understanding. Encourage groups to return to the Investigation Board to answer any inquiry questions that they can.	Investigation groups will be provided with a ball and a flashlight to create a model of the Earth and the sun to explain their data from the previous investigation through multiple attempts and adjustments. Refer to Investigation Board for any questions that can be answered.
4	**Explanation of the Phenomenon**	DCI- The orbits of Earth around the sun and of the moon	Call on groups to share their conclusions drawn	Share conclusions drawn from the past few experiments.

		around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.	from the past few experiments. Expand on the DCI for full understanding of the phenomenon presented to them in this unit. Discuss remaining inquiry questions on the investigation board.	Share any answers from the inquiry board. Develop a deeper understanding of the phenomenon based on additional information presented by the teacher.
5	**Summative Assessment**		Share a link on Google Classroom to the YouTube video clip ("Sun's shadow time lapse"). Instruct students to work independently using their technology device and a protractor to pause the video and measure the length and angles of the shadows at multiple intervals. Tell them to collect their own data and create their own graph to represent their collected data. Then, they must analyze the data and identify patterns of change in length and direction of	Students will use protractors to pause the video and measure the length and angles of the shadows. They will collect their own data from the video, create their own graph to represent their data collected, and reveal patterns identified from that graph to reveal the explanation of the phenomenon.

			shadows.	

Conclusion

My hopes for this product are to create an easily accessible and understandable lesson/unit template for educators of all grade levels to use to implement the NGSS until an official curriculum is released and adopted by districts. While this is a science unit, I hope for my students to practice these skills throughout various content areas.

I would like to see educators benefit from this product by using my sample unit to create additional lessons and units that meet NGSS. I want them to feel at ease with the structure of the unit and excited to put their own creativity into their lessons. Both new and experienced educators should take this template and collaborate with one another to make the best possible lessons for their students to be prepared for the CAST and for STEM careers and skills.

I understand that this product may not be appropriate for all classrooms because no two classrooms are the same. They function differently because of group sizes, behavior, performance levels, etc. However, this template is to be used as a guide; therefore, teachers have the freedom to modify and adapt any part of the template to best fit their classroom environment. This product may not be appropriate for much longer than a couple of school years. This template is meant to familiarize educators with NGSS and the three dimensions while guiding lesson creativity into units. Soon, curriculum approved by the NGSS and the state will be released and adopted for all school districts in California. Then, educators can take their knowledge from this product into the new curriculum to effectively teach the standards. I want teachers at all grade levels to use this product to familiarize themselves with the standards and structure and to explore the creative freedom that this template allows in order to teach NGSS effectively with their students in order to prepare them for the CAST.