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A Next Generation Science Standards (NGSS) Aligned 3rd Grade Weather Unit

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A Next Generation Science Standards (NGSS) Aligned 3rd Grade Weather Unit

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Chapter 1: Introduction

The Next Generation Science Standards (NGSS) have been adopted by schools but the transition for teachers has only just begun. The standards are available, and schools are starting to adopt them, but there needs to be a plan about how NGSS will flow with the integrated lesson approach. An integrated lesson approach looks at language arts, science, and math at the same time. These lessons are on a specific topic and/or theme. The ultimate goal of the integrated lesson approach is an integrated unit with real world connections. The focus of this creative component is the development and evaluation of an NGSS aligned integrated curriculum unit.

Students' capabilities to learn are sometimes not evaluated. A young child may be able to fill out a table with ease, but if that child does not work with the information beyond that, there is no real connection to the information and learning is unlikely to occur. According to Covitt, Gunckel, & Anderson (2009), young children can create diagrams on the water cycle, but fail to explain what the diagrams mean. Higher order thinking and connections to the information learned and prior knowledge are not applied at a young age. In some instances, science is only used as a topic for reading instead of a springboard for learning both subjects. A focus on reading in most elementary schools causes science to be a topic used in a reading block. Informational text read-alouds combined with hands-on experiences to integrate science knowledge can increase connections, but texts alone do not provide the needed science knowledge (Hoffman, Collins, & Schickedanz, 2015). Consequently, integration is important in the formation of knowledge; reading and doing science are key to a successful comprehension of the science topic.

An integrated learning approach combines the standards for English, math, and science all in a single lesson or unit. This is done mainly in the primary grades as the secondary structure

has the subjects taught as singular subjects. The combination of subjects accounts for informational gaps that may occur when these subjects are taught in isolation (Huff, 2016). Teaching should encompass all subjects together, not just in isolation. Scaffolding the subjects should occur each year as well to help broaden student knowledge. Students will make connections to the knowledge they are learning, and apply what they discover using this method. The NGSS is an interconnected look at science and how it is practiced and experienced in the real world (NGSS Lead States, 2013a).

The gap in literature is clear when you start to research the implementation of the individual sections of NGSS. Not much research exists on the implementation of the standards with weather and climate. NGSS is a new framework that differs from the previous lens of teaching science. Thus, the focus of this paper is on building an integrated curriculum for a specific section of third grade science. This curriculum covers the main ideas of weather and climate, from the Earth and Space Sciences section, using an NGSS aligned, integrated unit.

Chapter 2: Literature Review

Next Generation Science Standards (NGSS)

The previous state standards, Iowa Core in Science, was adopted in 2008. This set of standards focused on student inquiry, and making students more active learners. Course requirements were left up to individual districts, however the Iowa Assessments test science knowledge at all age levels. Iowa applied to be a Lead State partner in 2011 to further expand their adoption of new standards. The initial implementation plan for NGSS in all states commenced with the 2014-15 school year (NGSS Lead States, 2013b). Iowa accepted this timeline and adjusted to adopt the Next Generation Science Standards.

The NGSS is a set of standards that uses a new framework of learning with a three-dimensional approach to deepen student learning (NGSS Lead States, 2013a) The three dimensions of learning are: disciplinary core ideas (DCIs), science and engineering practices (SEPs), and crosscutting concepts (CCCs) (Miller & Januszyk, 2014). DCIs are the content knowledge that should be covered by the end of the unit. The SEPs are the hands-on activities, discussion, modeling, etc. that students do while learning the content and are based on the same practices that scientists and engineers perform. CCCs are topics that span across all science areas. The NGSS also uses Performance Expectations (PEs) as performance based objectives that students complete by the end of a unit. The PEs are not a curriculum, but serve as a framework to help build a curriculum around (NGSS Lead States, 2013a). PEs link together the SEPs, DCIs, and CCCs in a unit, are arranged with student developmental growth in mind, and built from kindergarten through to the end of high school (Wysession, 2013).

The Next Generation Science Standards for this project are in the Weather and Climate

section. The PEs for this unit state that students must be able to: display temperature data for a specific season on a table and a graph (3-ESS2-1), use climate information collected to describe a region in the world (3-ESS2-2), and create a design solution that would reduce a weather-related hazard (3-ESS3-1) (NGSS Lead States, 2013c). All three PEs combine parts of disciplinary core ideas, science and engineering practices, and crosscutting concepts to build a unit.

The standards are also aligned to third grade Iowa Common Core Standards for mathematics and literacy. The Iowa Common Core math standards state that students should be able to reason abstractly and quantitatively, model with math, use appropriate tools, and draw a scaled picture and bar graph to represent a data set with multiple categories and answer questions based on the graph (Grade 3: Mathematics, 2023). The Iowa Common Core Literacy Standards state that students will be able to ask and answer questions to show their understanding of a text stating reference pages, compare and contrast key points in multiple texts, write an opinion piece supporting a point of view with reasons, conduct short research projects, and recall information or gather information taking notes on sources and gather evidence (Grade 3: Literacy, 2023). This literacy standard is similar to the Science and Engineering Practice of making a claim and supporting it with experimental evidence.

Individual states are responsible for adoption and implementation after the publication of the NGSS. Teachers need to read into the documents they use. Then, they should discuss them with peers to get their full meaning. Teachers must completely understand NGSS before using it in their classrooms (Melville, Dowdle, & Campbell, 2015). Understanding a framework is something that takes time and discussion. Iowa has moved past the initial phases of understanding and unit preparation and is now focused on implementation with many resources

available to assist teachers (Iowa Department of Education, 2023)

Good Curriculum Design

A good curriculum is built with main topics, student inclusion, literacy, math, and social studies connections (VanTassel-Baska, J., & Wood, S. ,2010). Start with our learning outcomes, which are the PEs of NGSS. Any unit must be built off a PE and differentiation must be included to ensure all the varying levels of a student's abilities to understand, manipulate, and explain the main topic. Teachers must then consider the other standards that can be met with the unit. As time is limited in the day, it is best to combine subjects and meet multiple standards at once.

Main topics. Integrated units begin with a Main Idea (PE) which is dictated by the current standards and must be explicitly linked to a real-world connection. The main idea is important so topics progress smoothly from one to another as students advance through content. The main idea also provides a connection to the material at hand each day. A gap in information occurs when there is no main idea to work toward. Students are then left with unanswered questions. Questions exist when a connection to other material is not made. Students only see the topic in isolation, thus they missed the main idea (Pruitt, 2015). The NGSS provides three dimensions of learning to aid in student achievement and accomplishment of the PEs. This multidimensional approach ensures no gap in the main idea, thus less student questions.

Student inclusion. The next variable to consider is the class itself. A differentiated unit ensures that all students may take part. A differentiated unit considers the abilities of students who perform above, at, and below academic grade level. Students may need material adjusted to fit their needs, whether this means more challenging, or more outside assistance. There must be a

plan built for inclusiveness of different student needs in the classroom. Next Generation Science Standards, using all three dimensions in combination with effective teaching strategies can aid in making sure all students can meet all standards (Miller & Januszyk, 2014). Students learn in different ways. The NGSS is integrated with mathematics and literacy in a meaningful and substantive manner that allows for all students to gain fair and reasonable access to learning standards (NGSS Lead States, 2013a).

Literacy connections. Science concepts should start at a young age to help develop future science connections (NGSS Lead States, 2013a). This connection can be made with the use of literature. Picture books used with young children to teach the beginning concepts of the water cycle allows them to connect rain and clouds (Trundle & Sackes, 2010). Using picture books to start a lesson with upper-elementary students can lead to a deeper discussion of the main topic in the book. This can also start a new topic and help discover what students already know. During this time, the teacher should serve as a guide to help students understand concepts and ask questions (Ediger, 2014). Young students often have difficulty with information in expository texts, so picture books serve as a starting point for student reference before moving to expository texts (Ediger, 2014). Another way for students to understand expository texts is to create a lesson in conjunction with the text. In one study teachers found that using their science text as a resource allowed them to integrate art, movement, projects, and vocabulary lessons to enhance student learning and solidify concepts (Bryce, 2011). By approaching the material in various ways, the expository text serves as a resource to inform and expand learning.

Picture books and expository texts are not the only way to integrate literature and science. The use of narrative stories to teach about the world around us is also effective. Before writing, learning occurred through oral retelling. Narratives, like tales from ancient Greece, can

springboard upper-elementary students into varying lessons about science. They must also learn about scientists as more than just the stereotype. Students must read a variety of narrative books and books about science and scientists, in order to view science as a viable option for a future career (Horton, 2013). Literature can be a powerful connection to science when paired with NGSS.

Math connections. Traditionally, math is taught as a standalone subject with no connections to other subjects being addressed in the classroom, or the real world. Randomly measuring liquids to understand volume and creating graphs from predetermined data sets does not provide a connection for students. Nor do these experiences provide real-world connections for students to truly understand the importance of the concept. A 2013 study stated that there was no comprehensive model of integrating science and math teaching (Treacy & O'Donoghue, 2014). The integration of math and science should include hands-on work, inquiry, and discussion and can extend and expand the material being taught (Treacy et al, 2014). NGSS aims to integrate English, science, and math in a meaningful way that will expand and extend student knowledge.

Social Studies connections. Social Studies as an independent block of teaching time has not been the focus for several years. The importance of social studies has been revitalized with the revision of the standards in June 2017 (National Council for the Social Studies, 2017). With the changes to the standards also comes the revitalization of the idea of teaching social studies through social action in the classroom. Social action and NGSS go hand in hand as both have the goal of helping students prepare for their future as citizens (NGSS Lead States, 2013a; Bond, Elias, Nayman 2021). Social action uses service learning projects to get students involved in solving problems at school, locally, or globally. Using a field trip to a local farm, fifth graders

were taught a collection of lessons through the lens of social action/science (Bohach & Meade, 2014). Economics, population growth, problem solving, the impact of electricity, and wheat germination that served as an extension project were just some of the ideas used in a one day integrated unit designed by groups of preservice teachers. The students combined hands-on learning, problem solving, and cooperation to complete tasks. They were also responsible for finding a solution to a problem or answering a complex question before leaving for the next station. The overall result was an enhanced understanding of both the scientific and social studies content addressed. It should be noted that an intentional connection to the material in the classroom before and after the field trip was also conducted (Bohach & Meade, 2014).

Learning Through Inquiry

Inquiry is described as the activities through which students build knowledge and understanding of scientific concepts. Moye, Dugger, & Stark-Weather (2014) looked at teacher perceptions of "doing" science. According to Moye, et al (2014), most teachers in the study felt that students left their school with a lack of knowledge in science content. They also suggest the teachers felt students had a lack of connection to the material and they had no frame of reference to make the material meaningful to them. They also suggest the teachers felt using higher order thinking to apply the knowledge constructed would allow students to score better on standardized tests. Teachers felt this way based on their experiences because the students would have more understanding, and the ability to apply the knowledge gained. Due to all these factors, Moye, et al (2014) posit that teachers perceive a connection between inquiry and higher order thinking. According to Brusic & Steinmacher (2015), inquiry in combination with student curiosity will help teachers ask the questions to lead to a deeper understanding of the core curriculum by students. The development of the NGSS helps show the connection of higher

order thinking and inquiry through the inclusion of the three dimensions of learning.

Many types of instruction are important to gain a solid understanding of a topic and to engage students in higher order thinking. Literature can be a springboard toward inquiry in science and can serve to make students curious about a scientific topic. It is reasonable to expect that curiosity leads to questions and a desire to understand more about what the book described. Learning is too often classified as rote memorization. Students need to have hands-on experiences to connect to the concepts in science, technology, engineering, and math (STEM) (Yager, 2015). When thinking about the shift to NGSS and all that may entail in the elementary classroom, one must keep in mind learning through inquiry. Inquiry teaching is a student-centered way to help students discover the world around them through questioning, observation, experimentation, etc. (Brusic & Steinmacher, 2015). In a classroom focused on learning how things work and why, a student can gain a deeper understanding of the main idea (Passmore, 2015). Begin by providing a problem for them to solve or a question for them to answer. Let the students research or work out the solution or answer themselves, so that they have connected meaning to it on their own. Active learning, not just acquisition of facts, creates a connection to the material.

According to Gray (2014), the NGSS looks at inquiry through both historical and experimental sciences. Historical sciences are observable sciences (evolutionary biology, paleontology, geology, and anthropology) that were not considered in previous science standards. The NGSS provides a framework for teachers to apply authentic inquiry experiences for historical sciences that was previously not covered. According to Gray (2014), you need a combination of inquiry (experiments) and “non-experiments” to be taught in cohesion. Engaging students in inquiry in NGSS is achieved through engaging students in the SEPs, and allows them

to explore main ideas through discussions, hands-on activities like analyzing and collecting data, modeling, and more.

Misconceptions of Weather and Climate

Misconceptions elementary students have about weather are also important to know before constructing a unit on weather and climate. Students come to a classroom with varying levels of previous knowledge, some correct, some incorrect. A successful unit requires teachers to prepare instruction to address the different misconceptions students might have. Misconceptions are important for a teacher to know before the unit begins. It is also important to know what the current class knows. While Henriques (2002) stated that assessing students' prior knowledge was too time consuming, it helps differentiate learning and omit covering topics students already know well. Generally speaking, students have misconceptions about the water cycle (problems with phase changes), how clouds form (air temperature), and the difference between weather and climate (Henriques, 2002).

Covitt, Gunckel, & Anderson (2009) looked at K-12 student understanding of the water cycle in more depth and discovered that their misconceptions can be traced back to an evolution of misconceptions from a young age. When looking at the water cycle, young students can tell that the water disappeared, but they think it simply vanished. At an older age, they perceive that something has happened to it, but they still can't conceive that it has transformed into vapor. Students in this study also had difficulty tracing the water back to a liquid after it had evaporated. This evolution of misconceptions in water that occurred, helps to show that a more comprehensive connection to the parts of the water cycle must occur. A conversation about the water cycle must involve phase changes (Covitt et al., 2009).

Finnish researchers also found that students were unable to relate the water cycle and its phase changes before discussion of water in class (Havu-Nuutinen, Karkkainen, & Keinonen, 2011). Their connections to water involved everyday use and recreation with no connection beyond. The students saw no other use for water beyond the everyday. They saw no connection to how it affects temperature, plants, etc. and thus their misconception was that water was only a liquid. They were unable to make real world connections to it being a solid or a gas.

There is also a misconception among students about weather and climate. Students use the words weather and climate interchangeably, when in fact, they mean different things. According to the National Oceanic Atmospheric Administration (2023), climate is an average of weather conditions over a period of time and weather is the actual condition currently happening outside. According to Spiropoulou, D., Kostopoulos, D., & Jacovides, C. P. (1999), when given a question about the term weather, students confused the words weather and climate. They chose to describe it in only terms they could see themselves like rain and wind. Similarly, when given a question about climate, most students answered incorrectly and only viewed climate in terms of temperature.

Water cycle (problems with phase changes), how clouds form (air temperature), and the difference between weather and climate are misconceptions that must be addressed in a weather and climate unit. Multiple books, videos, diagrams, and discussions are used in the unit that address these three issues. The multiple books used in this unit describe all three topics and utilize diagrams to further showcase the phase changes in the water cycle. Bill Nye videos are used to describe and depict all three concepts as well. Both the books and the videos will serve as springboards to further discussions about the three concepts and create a deeper meaning to them. Weather and climate will be further explored in a lesson to showcase different climate

regions and a lesson about creating a weather hazard solution.

Theoretical Framework

This study operates under the constructivist learning theory. The constructivist theory states that learning occurs through active involvement in the creation of knowledge. The use of constructivism in education is partially based on the works of Bruner, Vygotsky, and Piaget (Juvova, Chudy, Neumeister, Plischke, & Kvintova, 2015). The teacher facilitates or guides the learning process while the student is the active participant in learning. Often called student-led learning, the students' motivation for learning, and problem solving is internal.

As a constructivist in the realm of teaching one must understand the existing schema of the students. Students come into the classroom with preconceived notions of science and it is the job of the constructivist teacher to guide students to understanding the views of the scientific community. Students must know how and why things happen to truly understand the concept. Just teaching the students facts will have no effect on their schema as they have no reference to its validity (Colburn, 2000). Students must use Science and Engineering Practices (SEPs) like: asking questions and identifying problems, developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information, to connect to the meaning behind the facts in their own mind using those experiences and the interactions that occur with others while learning. The SEPs are the way they expand their knowledge by questioning, building, solving, discussing, etc. SEPs are the physical and mental ways that students expand and evolve their knowledge.

A constructivist frame of mind when writing a curriculum lends itself to include inquiry as a main component. Learning through inquiry is a student centered, hands on approach that in NGSS is led through SEPs. Through inquiry students gain a deeper understanding and connection to the material being learned (Brusic & Steinmacher, 2015). This material is then generated into student knowledge (Passmore, 2015). The student leads the learning experience and the teacher is just the facilitator.

The SEPs are not the sole part of NGSS that are needed in the constructivist frame. PEs, or performance expectations, set up what a student is expected to do by the end of the lesson. This gives the student a clear goal to work towards. The CCCS, or crosscutting concepts, are the seven big ideas that students use in each standard of NGSS, in weather and climate they focus on patterns and cause and effect. The DCIs, or disciplinary core ideas, are the focus of a specific standard. For example, this unit uses Weather and Climate and Natural Hazards. These things together are the road map for the SEPs to be used with. If the curriculum is not set up using PEs, SEPs, CCCs, and DCIs in a way to achieve the end curriculum goal, the student will not create the desired learning experience.

Chapter 3:

My Unit

This is an integrated NGSS unit on weather and climate that also combines Iowa Core Standards in Literacy, Math, and Social Studies. This unit begins by attaining an understanding of the prior knowledge of students and an understanding of what they would like to know more about. The unit lasts five weeks and is incorporated into daily lessons for math and literacy. Literacy has the students create reports, read varying levels of books, create several visual projects for persuasion/opinion and poetry. In Math, students create graphs and work on solutions to problems involving weather. Social Studies has students learn about meteorologists, research weather related jobs, create a multimedia project to promote change, and fundraise to help an organization that provides clean drinking water.

Standards

The following table includes all the standards used in the unit about weather and climate that I created. As this is an inclusive unit I have included all the standards used from science, math, literacy, and social studies throughout the unit. Not all of these standards are used in every lesson. The Math and Literacy standards are listed with the science standards in NGSS, I have listed the corresponding science standards after the math and literacy standards. Social Studies has not been added to NGSS.

Science	**Math**	**Literacy**	**Social Studies**
3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. • DCI: Scientists record patterns of the weather across different times and areas so that they	MP.2 Reason abstractly and quantitatively. (3-ESS2-1), (3-ESS2-2),	RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text	SS.3–5. G.2 Understand how geographic and human characteristics create culture and

can make predictions about what kind of weather might happen next. ● SEP: Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. ● CCC: Patterns of change can be used to make predictions.	*(3-ESS3-1)*	as the basis for the answers. (3-ESS2-2), (3-ESS3-1)	define regions.
3-ESS2-2. Obtain and combine information to describe climates in different regions of the world. ● DCI: Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2) ● SEP: Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2) ● CCC: Patterns of change can be used to make predictions. (3-ESS2-1),(3-ESS2-2)	MP.4 Model with mathematics. (3-ESS2-1), (3-ESS2-2), *(3-ESS3-1)*	RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic. (3-ESS2-2)	SS.3–5. G.3 Understand how human factors and the distribution of resources affect the development of society and the movement of populations.
3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. ● DCI: A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1) ● SEP: Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-ESS3-1) ● CCC: Cause and effect relationships are routinely identified, tested, and used to explain change. (3-ESS3-1) ● CCC: Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones). (3-ESS3-1) ● CCC: Science affects everyday life. (3-ESS3-1)	MP.5 Use appropriate tools strategically. *(3-ESS2-1)*	W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-ESS3-1)	SS.3–5. G.4 Understand how physical processes and human actions modify the environment and how the environment affects humans.
	3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add,	W.3.7 Conduct short research projects that build knowledge about a topic. (3-ESS3-1)	

	subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. *(3-ESS2-1)*		
	3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in bar graphs. (3-ESS2-1)	W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-ESS2-2)	

Unit Outline

In Appendix A you will find a lesson plan outline followed by the full lesson plans in Appendix B. The first day of this unit a KWL chart is used to assess students' prior knowledge and then guide the teacher as to what may need more coverage when it comes to Weather and Climate. Graphing begins in the students' Persuasive Destination Project and Weather Centers later in the unit (Appendix C). Finally, a parent letter goes home explaining the unit to parents (Appendix F).

Students continue their graphing until day 21. Starting on day 2 several books are used to further student knowledge about weather and climate. The books used are in Appendix H. These

books are used to integrate Social Studies, Literacy, and Math into the Science Unit. Students are given an ABCs of Weather dictionary to write down weather words and their definitions to help them during the unit. On day 5 students expand upon a book by researching an organization that helps get water to locations that don't have it readily available (Appendix G). This research is then used for a Social Action project. The students use art to create a mixed media project to inform others about a fact or solution from *One Well: The Story of Water on Earth(Citizenkid)*.

On day 7 students begin their Persuasive Destination Project. This project may be a brochure, poster, etc. with an accompanying report. Their reports are taped and put on Seesaw. On day 14 students begin work on safety solutions which sets up the Final Project (Appendix D and E). This is an engineering project where students are expected to create a safety solution to an extreme weather condition. The final presentation is taped and placed on Seesaw.

Appendix I includes reviewers comments as I did not teach these lessons. This feedback was used to suggest further improvements to the unit.

Chapter 4

As I am not currently teaching third grade and was unable to teach this unit, I had it reviewed by a current third grade teacher (Reviewer 1) and the Curriculum and Instruction Coach (Reviewer 2) both at my current school. Reviewer 1 has been teaching for 7 years and previously taught second grade at another school prior to this one. Reviewer 2 is currently my Curriculum and Instruction Coach and also the Title 1 (Reading Recovery) teacher at the school and has taught for 15 years.

In reviewing my curriculum, both teachers mentioned a need to make adaptations to the lessons to accommodate diverse learners. I thought of some adaptations for the centers and the main project but did not include them in everything. There are many possible adaptations to account for when planning a lesson and since I typically adapt as I go, I admit to sometimes forgetting to explicitly add them into a written lesson plan.

The unit has several writing projects, like ABC Poems, clean water organization, comparing and contrasting a book to a movie, Persuasive Destination Project, weather graphing, and the Final Project. If a student needs help with writing any of these they could use a scribe. If they need to, they could have a partner or adult helper assist them in writing what they dictate. If the student is having difficulty getting started with writing any of the writing projects, examples could be modeled about different topics or something similar to help generate ideas. If the student does not need a scribe but is still struggling to write what they are thinking, sentences could be written down for them to copy. If it is a matter of the length of the assignment it can be shortened, paragraph requirements and sentence requirements could be changed. There is also the option to give an oral presentation instead of writing reports, help could be given to make an outline and then it can be presented. They may also use technology instead of a paper and pencil

to write the reports if needed.

Technology is used for most reports in third grade. If a student is having difficulty using a computer/iPad for their Persuasive Destination Project, or their Final Project on a weather hazard safety measure, they may write with paper and pencil instead. If the computer/iPad has text to speech software, the student may also be able to dictate their paper using the built in microphone. Another issue to think of, as students are learning to conduct research, is how to look up items safely and know what would be helpful information. If a student is struggling with the research portion of their clean water organization or their final project, help can be given to find the right search parameters for their topic.

If it is a visual need or a reading adaptation needed, the student could have books read aloud to them by their partner or an adult for their research portion of the Persuasive Destination Project and/or the Final Project. If available, use of audiobooks or a text to speech options on certain websites, like Hoopla or PebbleGo could be used. Also, instead of requiring a written presentation, an oral presentation of material could be given.

Reflecting upon the completion of my unit I hope that someone else is able to use the work I have done. While doing my research the thing that stood out the most to me was the misconceptions about weather and climate and how little research has been done. As we move on to the NGSS being a greater focus in the classroom, I hope that more research is done focusing on students' understanding of concepts. I noticed that the abstract concepts seemed to be the most difficult for them to understand. My hope is that with the connections to other subjects, their understanding is deeper, thus allowing them to understand the abstract concepts as well.

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Appendix A:
Outline of Unit

- Day 1: Introduction and KWL chart, Read *The Drop in My Drink: The Story of Water on Our Planet*; start Weather Poem Lesson; Start graph lesson, begin graphing weather in local town and town abroad chosen by student. Graphing will be done daily until day 21. Weekend information will be added in on the Monday class resumes. Letter sent home to parents that describes the unit, and the information is added to the class seesaw.
- Day 2: Who is a scientist? Discuss meteorology and other weather-related jobs, Read *The Science of Weather*
- Day 3: Read *You Wouldn't Want to Live Without Clean Water!* Go over timeline in book, discuss water cycle
- Day 4: Begin reading *One Well: The Story of Water on Earth (Citizenkid),* go over statistics given in the book.
- Day 5: Math problem presented-Water Around the World - students measure, compare information presented in *One Well: The Story of Water on Earth (Citizenkid),* and provide solutions. How does the lack of water impact those living in a region? Research organizations that help provide clean water to one of the low water areas discussed in the book.

  Class meeting: recap what you know and list what you still want to know. Video Friday: Bill Nye the Science Guy: Water Cycle
- Day 6: Social Action: create a mixed media art project to showcase one of the important facts/or a solution created from the book *One Well: The Story of Water on Earth (Citizenkid)*. Final product will be displayed in the hall to inform others. Present

information of the organization you researched that provides clean water. Class votes on organization to support based on student presentations. Fundraising ideas are discussed. Read *STEM Guides to Weather*; discuss and calculate the math problems given in the book. Have students create their own "weather problems" to share with the class over multiple days.

- Day 7: Start Brochure/Poster/etc. Persuasive Destination Project; go over rubric; location will be the one chosen as their second graph and a graph must be represented in their final product. Research Day for Persuasive Destination Project, "weather problems"
- Day 8: Work on Persuasive Destination Project, "weather problems" Students decide on a fundraising idea.
- Day 9: Work on Persuasive Destination Project, "weather problems", fundraising planning begins
- Day 10: Present Persuasive Destination Project - create a recording of the reports and put it on seesaw; Class meeting: recap what you know and list what you still want to know; Video Friday: Bill Nye the Science Guy: Climate, finalize fundraising plans.
- Day 11: Read *You Wouldn't Want to Live Without Extreme Weather!* go over the timeline, as a group, research one of the topics of extreme weather around the world (interesting facts after the timeline).
- Day 12: Report findings of extreme weather around the world, begin fundraising
- Day 13: Extreme Weather demonstrations, ex. Tornado in a bottle
- Day 14: Discuss extreme weather in Iowa and safety solutions that have been created to combat the extreme weather.
- Day 15: Introduce Final Project and rubric; choose groups, climate, and weather hazard;

Research Day for Final Project; Class meeting: recap what you know and list what you still want to know, what resources might you need for your project? Video Friday: Bill Nye the Science Guy: Storms

- Day 16: Begin Predicting the weather before graphing temperatures each day. Read *Cloudy With a Chance of Meatballs* and have students create their own food weather and write about what happens in ChewandSwallow Falls when their weather hits. They must describe the food weather as you would hear in a news report.
- Day 17: Watch Cloudy with a Chance of Meatballs, have students create newscasts of their food weather like Sam Sparks did in the movie. Compare and Contrast the book and the movie.
- Day 18: Final Project Workday
- Day 19: Let students create their own foodamils based off the movie Cloudy with a Chance of Meatballs 2. They must describe the practical functions of the animal parts they add to the food. Discuss prior work with adaptations to help them with ideas.
- Day 20: Review the books read in the Unit, Compare and Contrast the information given in the books and choose the book you found most helpful citing examples. Class meeting: how are you separating work on your team and what resources you are going to use/need to work.
- Day 21: Finalize graphs and compare/contrast both locations. Compare/contrast your predictions. Discuss the weather stations, give examples, and go over the weather station jobs timekeeper (30 minutes per station), principal investigator, record keeper, and materials manager. Explain that they all work together but each has a role for success. Jobs are rotated each station with jobs being voted on by group members for the last day.

- Day 22: Begin Weather Stations accomplishing 2 a day; work on final project
- Day 23: Weather Stations accomplishing 2 a day; work on final project
- Day 24: Weather Stations accomplishing 2 a day; work on final project
- Day 25: Present final project; Record presentations and place on seesaw.

Appendix B:
Lesson Plans

Introduction Lesson Day 1

Grade 3 Standards

Science:

CCC: Science affects everyday life. (3-ESS3-1)

Math: NA

Literacy:

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-ESS2-2), (3-ESS3-1)

W.3.8 Recall information from experiences or gather information from print and digital sources;take brief notes on sources and sort evidence into provided categories. (3-ESS2-2)

Social Studies : NA

I will read *The Drop in My Drink: The Story of Water on Our Planet.* We will create a Know, Want, Learn chart about weather and place it in the room so we may track our Want and Learn items during the unit.

Objective:

The objective of this lesson is to introduce the weather unit and create a sense of curiosity for the learning ahead.

Materials:

The Drop in My Drink: The Story of Water on Our Planet, easel size post-it paper, marker, computers, KWL Google Document, **(Blue words are the teacher script)**

Modifications:

Students may choose to write down their ideas on a piece of paper instead of sharing outloud, they may also have help writing their ideas if needed by aid from a group member or adult.

Engage:

I will start the lesson by reading students *The Drop in My Drink: The Story of Water on Our Planet*. As I read, I will stop to ask the students connecting questions. The blue dialogue is "teacher talk", or a suggestion as to how I would approach teaching this.

Book quote	**pg #**	**Follow up question**
Where did you come from drop of water	**1**	Where do you think our water comes from?
The water our Earth began with	**2**	What do you think the author means when she says this?
Earth is 4.6 billion years old. But the drop in my drink is even older.	**3**	How old do you think the water we drink is then?
The drop in my drink has been from all the world's oceans.	**5**	What are you thinking about the water you drink now?
The drop in my drink has been in millions of living things	**11**	How do you think the author knows this?

Shifting, stripping, scraping, grinding. Eroding, rearranging.	**14**	What do these works make you think of? Are you making an image in your imagination?

Before we talk about the water cycle, which is part of our weather unit, I want to find out what you already know about the weather.

We are going to make a chart that tells what you know, what you want to know, and then as we go, we will add what you have learned. Before we add things to our chart, I want you to get with your science group and discuss things you know about weather. You may add your ideas to our science google document that is titled KWL weather. Once time is up, please add one idea to the class list. Students will be given five minutes with their group to brainstorm ideas. Once they have had time to go over the information, each group will add the post-it chart paper for K.

After the K has been filled out, I will read the students the last pages of the book, (Looking After Water, The Water Cycle, and Amazing Water Facts). Now that we have gone over the water cycle a little, what questions do you have, what more do you want to know about weather. On page 2 of the Google document, add in what you want to learn more about, discuss it with your group. After your 5 minutes have stopped, please add one item to the Want column on our Chart.

Over the course of this unit, we will be creating graphs, making brochures for travel destinations, writing poems, tracking weather locally and abroad, and creating our own prototype for a weather-related safety device. As we continue in this unit, we will add to the list of things

we know and write down things we have learned that we didn't know before.

This will be ongoing as the groups are working together. They will be evaluated on their participation in their group. Their ideas do not have to be selected, but they should be offering up what they think.

Weather Poems

Lesson Days 1-7

Grade 3 Standards

Science:

CCC: Science affects everyday life. (3-ESS3-1)

Math: NA

Literacy:

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-ESS2-2), (3-ESS3-1)

W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-ESS2-2)

Social Studies : NA

Objective:

Students will create original poems about what they see in clouds and revise one of their rough drafts to create a final copy with illustration.

Materials:

Weather Words, pencil, paper, ABCs of Weather, *The Cloud Book*, 11 X 16 paper, scissors, *Weather; Poems for All Seasons*, Examples of Acrostic and ABC poems

Modifications:

Students may have assistance writing in their ABCs book if needed, the letter H was set as a standard for the first poem as others continued to Z. The Weather Words book could be used to assist those that were having difficulty thinking of things that are in the clouds. One weather

word could be used instead of two.

Engage:

Read the book *Weather Words and What They Mean* on day 1. As you read the story, students will use their ABCs of Weather book to write down weather words they don't know. Pause for words that may be difficult so the students can have time to write them down. Some students may need the words written down on the white board so they have the correct spelling.

Examples of words: temperature, air pressure, moisture,evaporate, humidity, water vapor, etc.

Book quote	**pg #**	**Follow up question**
Moisture in the air comes from water that evaporates, mostly from the oceans.	**4**	**What do they mean when they say the water evaporates?**
High pressure often brings fair weather.	**8**	**What kind of weather are you having if it is fair?**
Read section on Cumulus, Cirrus, and Stratus Clouds	**13**	**Why do both Cumulus and Cirrus clouds mean fair weather?**
Sometimes there are floods when it rains a long time.	**19**	Why does the rain cause a flood?

Homework for tomorrow: Look at the clouds, what do you see? I will tell you what I see in the clouds tomorrow and we will talk in table groups about what we saw.

Explore:

On day 2 read *The Cloud Book* and discuss different things they have seen in clouds.

Book quote	pg #	Follow up question
Cirrocumulous Clouds are small, fleecy masses that are hard to see.	**12**	**Why do you think the author used the word fleecy to describe the clouds?**
Some people call them mackerel sky.	**12**	**First the author compared them to sheep, now he is comparing them to fish, why?**
Cirrostratus Clouds are sometimes called "bed-sheet clouds".	**13**	**Look at the picture of cirrostratus clouds, why is the author comparing them to sheets?**
Cumulonimbus clouds are the kind of clouds you see during a thunderstorm.	**17**	The author compares cumulonimbus clouds to a mountain, how do you think the author came up with that visualization?
People saw giants, animals, ships, and castles in the clouds, too!	**23**	What do you think the author meant when he said that people saw those things in clouds?
He's in a fog. She has her head in the clouds.	**28**	These are examples of idioms the author used. An idiom is a saying that you can't understand by the words alone, they are said together

		to have meaning. Can you think of any examples? Ex. raining cats and dogs, see the light, under the weather, spill the beans, etc.

Students will first discuss their ideas with their table partners and write down their ideas. Then as a class, take turns writing their ideas on the white board for all to see as a visual when you start writing poems. Begin rough draft of poem.

Examples of things in the clouds: dragons, fish, ducks, cows, a door, etc.

Explain:

ABC and Acrostic Poems

After the discussion about clouds we will discuss ABC poems.

Students, an ABC poem uses the alphabet to guide the words you choose to describe a topic. Our topic is clouds so take a look at your Weather Words you wrote yesterday and think of ones you would like to use. After several minutes bring students together to do an example of an ABC poem using a different topic. Let's practice what an ABC poem is by making one together on the whiteboard. Let's use the topic animals:

Possible Example:

A tiger ran across the jungle floor.

Bouncing bunnies in a yard.

Cows chewing their breakfast.

Dogs chasing squirrels up trees.

Make sure to have other examples available while students are working.

Students will start their poem and must reach H in the alphabet. An example will be given to show students they may separate the alphabet to create several poems in one. For example: ABCD may be about one cloud and EFGH may be about another cloud. Giving space between the break of letters to show the differentiation in poems.

Day 3: Students will finish their rough drafts of the ABC poem.

Day 4: We will look at the book *Weather: Poems for All Seasons* and discuss more ideas for things you can see in the clouds.

Book quote	**pg #**	**Follow up question**
Now I see that pancake stuck against the sky.	**11**	**Why do you think they are talking about pancakes if the poem is called Sun?**
White sheep, white sheep where did you go?	**23**	**Why is the author talking about sheep if the poem is called Clouds?**
And wake the flowers from sleep.	**27**	**How do you think the March wind wakes up the flowers? Did the author really mean the flowers were doing that?**
Cracking and Crashing, Racing and Roaring	**36**	When words sound like the sound that they make, that is called onomatopoeia. Can you think of other words that sound like you say the word? ex drip, plop, zap, etc.

The fog comes on little cat feet.	**38**	Does the poet really mean that a cat is around when the fog comes in?

A review of the resources they have will help them brainstorm more. Then an introduction of Acrostic poems with two examples will be given.

Today we are going to talk about another type of poetry called an Acrostic poem. In an Acrostic Poem you use the letters that go down to make a word and the poem goes across.You can use words, phrases, or sentences. For example:

Down the path I go.

An hour or more to explore.

You can't see it all given the timeframe.

Modification: Down

Another

Yard

Day 5: Time will be given to finish their poems and discuss which poem they would like to use to create a rough draft.

Elaborate:

Day 6: A review of self-revision ideas will be done as a class using a tablet or computer. Students will then revise the poem they chose. Then they will rewrite their poem on a plain 8.5 x 11 white paper. After revision they will use an 11 x 16 white piece of paper to trace out and then cut their cloud. After they have cut out their clouds, they will mount them on an 11 x 16 piece of blue construction paper and then put their poem in the center.

Day 7: Final day to finish poems. If the students finish early, they will read a book while the others finish.

Evaluate:

During the process students are asked weather words to check their understanding of the important words we are working with. Reviews were also done for their understanding of ABC poems and Acrostic poems as they are new to some students. They were also required to use a minimum of two weather words in each poem.

Weather Graphs/Persuasive Destination Project

Lesson Days 1-21

Grade 3 Standards

Science:

3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

- DCI: Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.
- SEP: Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships.
- CCC: Patterns of change can be used to make predictions.

3-ESS2-2. Obtain and combine information to describe climates in different regions of the world.

Math:

3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in bar graphs. (3-ESS2-1)

Literacy:

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-ESS2-2), (3-ESS3-1)

W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-ESS3-1)

W.3.7 Conduct short research projects that build knowledge about a topic. (3-ESS3-1)

W.3.8 Recall information from experiences or gather information from print and digital sources;

take brief notes on sources and sort evidence into provided categories. (3-ESS2-2)

Social Studies : SS.3–5. G.2 Understand how geographic and human characteristics create culture and define regions.

SS.3–5. G.3 Understand how human factors and the distribution of resources affect the development of society and the movement of populations.

Objective:

Students will create weather graphs using information from local weather and a destination of their choice. They will then use this information to make predictions about weather and create a brochure/poster and report convincing tourists to visit their secondary destination.

Materials:

iPad or computer, graphing paper, The Weather Channel online, 8.5 X 11 paper for brochure (trifolded for them), crayons, colored pencils, pencil, travel brochures

Modifications:

Students may have assistance researching and choosing a destination if needed. Keyword search examples and websites to use may be given. Notes may be taken on a computer, by hand, or by a scribe when stated out loud. Assistance graphing may also be given if needed.

Engage:

Day 1: Start by having travel brochures of Iowa placed on the board. Read some of the interesting facts you think your students will enjoy.

Before I read this brochure to you, did you know about this interesting place in Iowa. How do you think they decide what to make a brochure for a destination? Well we are going to

make our own brochure about a destination of your choice. However, we are going to use the weather to help us decide what facts to include in our brochure. People need to have options when they go to visit a destination. We are also going to compare and contrast our weather to that of the destination you choose. I will give you a little time to look at our globe and map to see a place that interests you outside of Iowa. I will have a signup sheet in the front when you are ready.

Explore:

They will be given time to explore their destination and choose spots at their destination that they think would be interesting. Have them take notes so they are prepared for making their brochure.

I want you to take ten minutes and look over your destination to make sure it is a place you would like to continue with. If you want to change your destination this is the only time you may do so.

Explain:

Days 1-21 Start graphing. The students will graph for 21 days before they complete their brochure. They will also use their graph information in a center toward the end of the unit. Weekend information will be added in on the Monday class resumes. Have an example of a graph completed so they understand where to place the temperature and date. Do the current day's weather on a graph together so that they may practice before you let them do their destination graph for today on their own.

Now I would like to have us come back together so that we may make our graph for home. We will put today's date on the x axis which goes along the bottom and the temperatures on the y axis. Now your y axis may look different for your destination. Why would that be?

Talk about varying degrees of temperature at different times in different locations of the world. Let them know that you will help with the destination graph if they need it.

Elaborate:

Day 7: Start Brochure/Poster/etc. Persuasive Destination Project; go over rubric; location will be the one chosen as their second graph and a graph must be represented in their final product. Research Day for Persuasive Destination Project.

Day 8-13 Work on Persuasive Destination Project

Day 14-15: Present Persuasive Destination Project - create a recording of the reports and put on class seesaw.

Day 16: Begin Predicting the weather before graphing temperatures each day. Explain to the students what predicting is and have them make a new graph for their prediction of days 16 to 21.

Class, now that we have had some practice graphing and we have an idea for what the weather is going to be like at home and at our destination, I want us to try something new. Starting today, before you look up the actual weather, I want you to make a prediction of what you think the weather will be and graph that. After you graph that you may look up your actual temperature. I want you to know that we are just trying our best guess and I do not expect you to get the exact temperature.

Go ahead and get two new pieces of graph paper, label them Prediction Home and Prediction Destination. Then label and write your information for the x and y axis. Last, graph your prediction for today. After you complete that you may do today's actual temperature.

Evaluate:

Day 21: Finalize graphs and compare/contrast both locations. Compare/contrast your predictions.

Who is a scientist?

Day 2

Grade 3 Standards:

Science:

CCC: Science affects everyday life. (3-ESS3-1)

Math: NA

Literacy:

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-ESS2-2), (3-ESS3-1)

W.3.8 Recall information from experiences or gather information from print and digital sources;take brief notes on sources and sort evidence into provided categories. (3-ESS2-2)

Social Studies : NA

Objective:

Students will understand that anyone can be a scientist and explore weather related scientists.

Materials:

paper, pencil, *The Science of Weather,* crayons, colored pencils, markers, KWL chart.

Modifications:

Students may choose to write down their ideas on a piece of paper instead of sharing outloud, they may also have help writing their ideas if needed by aid from a group member or adult.

Engage:

Ask students to brainstorm what they know about scientists and then have them draw

what they think a scientist would look like.

Today, I want you to brainstorm what you know about a scientist. We will write what you know on our KWL chart. Next let's think of things we want to know about a scientist. As we explore this unit we will add things we want to know about scientists and what we learn about scientists. Now that we have done some brainstorming together, I want you to draw me a picture of a scientist. I want to see what you think a scientist looks like.

Give them 10 minutes to draw what they think a scientist is, encourage them to add as much detail and things a scientist would need. Make sure that when you are encouraging them to add more that you don't alter their perspective of what a scientist is.

Explore:

Explain that all scientists can look different and that they are scientists.

In climate and weather they call these scientists meteorologists. Let's read *The Science of Weather* to learn more about climate, weather, and scientists involved in this field.

Book quote	**pg #**	**Follow up question**
Different areas of the world have different types of weather.	**4**	**What weather do we have? What weather words could you use to describe it?**
During summer Earth tilts towards the sun.	**11**	**How does this affect the season?**
Moisture from seas and oceans rises into the air and forms clouds.	**18**	**What is the moisture that rises called?**
It takes 5 seconds to travel one mile.	**20**	**So if it takes you fifteen seconds to hear the thunder after you see the**

		lightning, how far away is it?
In some areas of the world, the land is so dry that crops can not survive.	**25**	**What are the crops missing in order to survive in a desert?**
Some meteorologists work for the government.	**29**	**How do you think a meteorologist would help the government?**

Water Cycle

Days 3-10

Grade 3 Standards:

Science:

CCC: Science affects everyday life. (3-ESS3-1)

Math:

MP.2 Reason abstractly and quantitatively. (3-ESS2-1), (3-ESS2-2), *(3-ESS3-1)*

MP.4 Model with mathematics. (3-ESS2-1), (3-ESS2-2), *(3-ESS3-1)*

MP.5 Use appropriate tools strategically. *(3-ESS2-1)*

3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. *(3-ESS2-1)*

Literacy:

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-ESS2-2), (3-ESS3-1)

RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic. (3-ESS2-2)

W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-ESS3-1)

W.3.7 Conduct short research projects that build knowledge about a topic. (3-ESS3-1)

W.3.8 Recall information from experiences or gather information from print and digital sources;

take brief notes on sources and sort evidence into provided categories. (3-ESS2-2)

Social Studies :

SS.3–5. G.2 Understand how geographic and human characteristics create culture and define regions.

SS.3–5. G.3 Understand how human factors and the distribution of resources affect the development of society and the movement of populations.

SS.3–5. G.4 Understand how physical processes and human actions modify the environment and how the environment affects humans.

Objective:

Students will understand the water cycle and how that affects life on Earth. They will brainstorm a way to help those in need.

Materials:

You Wouldn't Want to Live Without Clean Water!, One Well: The Story of Water on Earth (Citizenkid), 11 x 16 paper, crayons, pencil, paper, colored pencils, markers, paint, newspapers, construction paper, magazines, items from home to be reused.

Modifications:

Math problems can be solved with a partner. Research can be done in a group or with an adult assisting. Sentence starters can be used for the presentation, but can be done orally instead of written if needed.

Engage:

Day 3: Read *You Wouldn't Want to Live Without Clean Water!*

Book quote	**pg #**	**Follow up question**
Much of that water becomes runoff, flowing downhill and eventually reaching the ocean….where the cycle begins again.	**2**	**How does the cycle begin again?**
Of course the water you drink needs to be free of germs in order for you to avoid illness.	**10**	**What do you think would happen if the water we had to drink was not clean?**
Still others seem to survive without it…	**14**	**What plants and animals that you can think of seem to survive with little to no water?**
It can be fun to find ways of saving water that still let you live normally.	**17**	**What ways can you think of to save water?**
In the future there might even be human settlements….	**28**	**If you went to another planet, how would you find water?**

After reading the main part of the book, go back and talk to the students about the facts at the end and the timeline at the beginning. Review what the water cycle is from the beginning of the book.

Explain:

Day 4: Begin reading *One Well: The Story of Water on Earth (Citizenkid),* go over statistics given in the book.

Book quote	pg #	Follow up question
The amount of water on Earth hasn't ever changed.	**5**	**How could the amount of water on Earth not change?**
Water is important to plants, but plants are also important to water.	**11**	**Why are plants important to water?**
Animals would starve.	**12**	**How do you think water-based species are important to the human food web?**
But most of the freshwater-over 99 percent-is frozen in ice caps and glaciers…	**19**	**If all but 1% of the freshwater we need is frozen, how do we get water?**
The average person today uses about six times more water than a hundred years ago.	**23**	**Why do you use more water today than 100 years ago?**
Remember-every drop counts.	**26**	**How can you help conserve water?**

Explore:

Day 5: Math problem presented-Water Around the World - students measure, compare information presented in *One Well: The Story of Water on Earth (Citizenkid),* and provide solutions. Page 20/21, They tell you a bucket of water weighs 10, then they give you a chart of the buckets of daily use. Have the students calculate the buckets into liters of water for each region listed on the chart. Then have them calculate the weight of all the buckets together (22

lbs. per bucket)

Today we are going to solve the math problems given to us in *One Well: The Story of Water on Earth (Citizenkid)*. With your group you are going to calculate the amount of water in liters and then the amount of water in pounds.

How does the lack of water impact those living in a region? Page 28 of *One Well: The Story of Water on Earth (Citizenkid)*, read about becoming well aware and about Ryan Hreljac. Research organizations that help provide clean water to one of the low water areas discussed in the book.

Now that we know more about the water on Earth and how it is a limited resource. I would like you to find out more about organizations that help provide water like Ryan's Well Foundation. With your group research and decide on one organization to tell us about tomorrow.

Elaborate:

Day 6: Social Action: create a mixed media art project to showcase one of the important facts/or a solution created from the book *One Well: The Story of Water on Earth (Citizenkid)*. Final product will be displayed in the hall to inform others.

Today I want you to think about the important information we went over in *One Well: The Story of Water on Earth (Citizenkid)*. I want you to choose an important fact or a water solution that was presented in the book and create a visual representation of your idea. You can use 11 x 16 paper, crayons, pencil, paper, colored pencils, markers, paint, newspapers, construction paper, magazines, and items from home to be reused. This is your chance to show others what you have been learning and what you want them to know about it. These will be on display in the hallway once you finish them.

Present information of the organization you researched that provides clean water. Class votes on organization to support based on student presentations. Fundraising ideas are discussed.

Class, we are going to take turns talking about the organizations we found for helping with clean fresh water to places that need it. After presentations, write all organizations on the board. Thank you, these were all great presentations, now I want us to pick one that you feel can help the most. Tally votes and then discuss, as a class, the organization chosen. Now I would like us to consider raising money to send to this organization. What are some ideas on how we can help? Brainstorm ideas and choose a way to raise money.

Extreme Weather

Days 9-24

Grade 3 Standards:

Science:

CCC: Science affects everyday life. (3-ESS3-1)

Math:

MP.2 Reason abstractly and quantitatively. (3-ESS2-1), (3-ESS2-2), *(3-ESS3-1)*

MP.4 Model with mathematics. (3-ESS2-1), (3-ESS2-2), *(3-ESS3-1)*

MP.5 Use appropriate tools strategically. *(3-ESS2-1)*

3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. *(3-ESS2-1)*

Literacy:

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-ESS2-2), (3-ESS3-1)

RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic. (3-ESS2-2)

W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-ESS3-1)

W.3.7 Conduct short research projects that build knowledge about a topic. (3-ESS3-1)

W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-ESS2-2)

Social Studies :

SS.3–5. G.2 Understand how geographic and human characteristics create culture and define regions.

SS.3–5. G.3 Understand how human factors and the distribution of resources affect the development of society and the movement of populations.

SS.3–5. G.4 Understand how physical processes and human actions modify the environment and how the environment affects humans.

Objective:

Students will understand the severity of extreme weather. They will use math to help solve STEM problems.

Materials:

STEM Guides to Weather, You Wouldn't Want to Live Without Extreme Weather!, tablet/computer, pencil, paper.

Modifications:

Students may have a partner for the math problems. An adult may assist with writing out the problems. One problem may be created instead of multiple.

Engage:

Day 9: Read *STEM Guides to Weather*. Do not read the STEM facts, have the students try

to solve them after.

Book quote	pg #	Follow up question
Technology gives meteorologists access to incredible amounts of weather data as they prepare for the news.	5	How do you think technology helps a meteorologist?
Along with the three basic types of clouds…	8	What were those types of clouds?
Climate is measured according to two conditions: temperature and precipitation.	15	What is the climate? How is it different from the weather?
Depending on where you live you may have never seen snow.	30	Where is a place that you think has never seen snow in the United States?
Hurricane winds use another scale of measurement.	38	Why do you think hurricane winds use a different scale than the Beaufort Scale?
Using math to predict weather has helped people, and even saved lives.	44	How do you think math has helped save lives?

As a class go over some of the STEM problems provided and see if they can answer them before you provide the answer from the book.

Explain:

As a class go over some of the STEM problems provided and see if they can answer

them before you provide the answer from the book.

Explore:

Have students create their own "weather problems" based on the facts from the book. Have them share with the class when complete and have the class try to solve the problems.

Elaborate:

Day 11: Read *You Wouldn't Want to Live Without Extreme Weather!*

Book quote	**pg #**	**Follow up question**
But they are different things, and the difference is really quite easy to understand.	**6**	**We have talked about this before, does anyone know the difference between weather and climate?**
That's why we often see the lightning first, then a few seconds later we hear the thunder.	**10**	**Does anyone remember how many seconds we learned it takes?**
Firefighters build a controlled fire, called a backfire or backburn…	**14**	**How would a backfire help stop a wildfire?**
And without periods of extreme rain, they wouldn't be able to grow crops.	**18**	**Can you think of a place that gets extreme rain?**
The one thing that unites all of these approaches is imagination…..	**22**	**Can you think of a new solution to live in an area with extreme weather?**
Space probes have already given us a firsthand view of weather on other planets…	**28**	**What do you think we can learn from weather on other planets?**

Go over the timeline, as a class and read the interesting facts at the end of the book. Then research one of the topics of extreme weather around the world from the book with your group.

Fiction Connection

Grade 3 Standards:

Science:

CCC: Science affects everyday life. (3-ESS3-1)

Math:

MP.2 Reason abstractly and quantitatively. (3-ESS2-1), (3-ESS2-2), *(3-ESS3-1)*

Literacy:

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-ESS2-2), (3-ESS3-1)

RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic. (3-ESS2-2)

W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-ESS3-1)

W.3.7 Conduct short research projects that build knowledge about a topic. (3-ESS3-1)

W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-ESS2-2)

Social Studies :

SS.3–5. G.3 Understand how human factors and the distribution of resources affect the development of society and the movement of populations.

SS.3–5. G.4 Understand how physical processes and human actions modify the environment and

how the environment affects humans.

Objective:

Students will demonstrate their understanding of weather in a creative way. They will be able to create food weather and record a report as if they were meteorologists.

Materials:

Cloudy With a Chance of Meatballs book and movie, tablet/computer, paper, pencil, crayons, colored pencils, markers, and Cloudy with a Chance of Meatballs 2 movie.

Modifications:

The paper may be written on computer or with paper and pencil, the presentation may be given orally having a scribe write down notes from the student. Any writing limits may be shortened.

Engage:

Day 16: Read *Cloudy With a Chance of Meatballs*

Book quote	**pg #**	**Follow up question**
…there lay the tiny town of ChewandSwallow.	**5**	**Why do you think the town is named ChewandSwallow?**
…it came three times a day at breakfast, lunch, and dinner	**7**	**Why do you think the weather came three times a day? Is that normal for weather?**
The people could watch the weather report on television in the morning and they could hear a prediction of the next day's food.	**11**	**How could they predict the food?**

Record breaking pasta fall causes chaos.	**17**	**What kind of weather do you think this was?**
A huge pancake covered the school.	**20**	**What do you think would happen if a pancake covered the school?**

Explore:

Day 17: Watch Cloudy with a Chance of Meatballs, have students create their own food weather and write about what happens in ChewandSwallow Falls when their weather hits. They must describe the food weather as you would hear in a news report (Like Sam Sparks does). Compare and Contrast the book and the movie.

Now that you have seen the movie, I want you to come up with your own food weather news report. It should be at least a paragraph. Once you have completed it we will record you giving your news report and post it on Seesaw.

Now that you have completed your news report, write a report that compares and contrasts the book we read to the movie. How are they alike and different? I want at least one paragraph on likes and one paragraph on dislikes.

Elaborate:

Day 19: Watch Cloudy with a Chance of Meatballs 2. Let students create their own food animals (foodamils) based on the movie Cloudy with a Chance of Meatballs 2. They must describe the practical functions of the animal parts they add to the food. Discuss prior work with animal adaptations to help them with ideas.

Now that we have seen Cloudy with a Chance of Meatballs 2, I want to give you a chance to create your own foodamil like in the movie. I want you to select one animal and one food to

combine together. Use the ideas we talked about in our animal adaptations unit to help you decide what to combine. How will combining these two things help your foodamil survive? What environment will it live in and how do these adaptations help them survive. After we create our foodamils we will present them to the class and then place them in the hall for other students to see.

Weather Centers Days 21-24

Day 21: Discuss the weather stations, give examples, and go over the weather station jobs timekeeper (30 minutes per station), principal investigator, record keeper, and materials manager. Explain that they all work together but each has a role for success. Jobs are rotated each station with jobs being voted on by group members for the last day.

Grade 3 Standards:

Science:

3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

3-ESS2-2. Obtain and combine information to describe climates in different regions of the world.

Math:

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in bar graphs.

Literacy:

W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.

W.3.7 Conduct short research projects that build knowledge about a topic.

W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

Objective:

Students will use prior knowledge to assist them in completing experiments, observing what is happening, analyzing what is happening, and gathering new information by working through the questions I have posed at each station.

Materials:

Folder, pencil, clipboard, data sheets, cooperative learning team cards, water, ice, crushed ice, spoon, strainer, glass jar, instructions, laminated center numbers, blender(adult use), coffee pot (adult use), cups, white cardstock, funky scissors, cups, 2 labeled tin cans, water jug, pitcher for hot water, salt, towels, baggies, pop apart buttons, plain paper circle cutouts, bar and line graphs, Fujita scale, hand sanitizer, extra time activities, and previous student work to add in answering questions posed.

Modifications:

Writing may be done by a scribe or partner. Groups may be modified. Time may be adjusted to longer or shorter periods. Adults may assist in groups if needed.

Engage:

Today is the day you put your knowledge you have been working on to the test. We will be using what we have learned about extreme weather, the water cycle, and use our weather graphs to complete these stations today. Make sure you are working together and each doing your assigned job at each station. I will be collecting the worksheets at the end of the stations as your exit tickets. You have each been assigned a starting station and will have 30 minutes per station to complete your tasks.

Explore:

Students have been working on a large weather unit and this is one of the final big activities. Students can use previous work and materials to aid them in answering the questions posed at each center. Students will provide a data sheet to move to the next task, however the teacher observations and questioning will serve as the assessment more than a complete data sheet. Students were preselected for teams and a mini activity was done before day one of the centers to check for teamwork abilities before roles were finalized in the teams. Modifications were made so that students who may require extra help were placed in larger teams and the roles assigned were in some ways to challenge students, and in others to provide extra responsibility. Information given to students prior to today was level based in some instances, for example information about the weather cycle was tiered.

Center 1: Water Cycle

Students are to place water into a cup and place it in a baggie in the window to simulate the water cycle using heat from the sun. A modification was made to use hot water as the window was not warm enough to cause the experiment to work. Students are to describe the

water cycle in their own words, describe what they are seeing happen in the baggy, and use prior information to answer other questions posed.

Center 2: Dew and Frost

Students are to place water and ice in can one and ice with salt in can two and use a spoon to mix them. They are to observe the reactions and write down what is happening. Various other questions are asked like why they believe the reactions happened the way they did.

Center 3: Snowflakes

Information is given on snowflakes and then the task is given to make a six-pointed snowflake that is unlike the other members of their team. At the end students have their pictures taken by the teacher. This center is to further the knowledge they have already received about weather events like snow.

Center 4: Fog

Students place hot water in a glass jar and then empty almost all the liquid. After they have done that, they place a strainer on top and put ice cubes in it. As the reaction is taking place students are observing and answering basic questions that move into higher level by asking them to explain what they believe.

Challenge: Hand Sanitizer

Students place hand sanitizer on their hands two times and record what their hands feel like. They then answer questions as to what part of the water cycle they believe this reaction is and why.

Center 5: Measurement and Temperature

Students use graphs they previously made to answer questions on the difference in temperatures, highs and lows, they use their previous knowledge on what type of graphs they are. They are also given the Fujita scale as we have discussed tornado damage. They must answer questions on damage using the provided scale.

Center 6: Low Pressure Fronts

Information is provided on low pressure fronts and students must answer questions on their data sheet. After the sheet is completed, they will create two button circles, one with the weather cycle, and one with any type of weather. At the end they must ask a teacher to take their pictures.

Elaborate:

Challenge: Hand Sanitizer

Students place hand sanitizer on their hands two times and record what their hands feel like. They then answer questions as to what part of the water cycle they believe this reaction is and why.

Evaluate:

The evaluation of these centers is the correct completion of the worksheets created at each station.

Science and Engineering Project

Grade 3 Standards:

Science:

3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

Disciplinary Core Ideas:Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2)

ESS3.B: Natural HazardsA variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1) (Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2.)

Science & Engineering Practices:Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-ESS3-1)

Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2)

Crosscutting concept(s): Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones). (3-ESS3-1)

Literacy:

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-ESS2-2), (3-ESS3-1)

W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-ESS3-1)

W.3.7 Conduct short research projects that build knowledge about a topic. (3-ESS3-1)

W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-ESS2-2)

Math:

MP.2 Reason abstractly and quantitatively. (3-ESS2-1), (3-ESS2-2), *(3-ESS3-1)*

MP.4 Model with mathematics. (3-ESS2-1), (3-ESS2-2), *(3-ESS3-1)*

MP.5 Use appropriate tools strategically. *(3-ESS2-1)*

Social Studies:

SS.3–5. G.4 Understand how physical processes and human actions modify the environment and how the environment affects humans.

Objectives:

Students will understand that humans can take steps to reduce natural hazards. They will explore how engineers help solve problems by improving existing solutions, or create new solutions, and how they reduce risks. They will provide evidence to show how the solution meets the criteria required to solve a given problem.

Materials:

Books (gathered from library by teacher), iPads/Computers, Checklist – 1 per student, Science Notebook (A notebook for science ideas and vocabulary used throughout the year), Bill Nye Video on Storms- https://www.schooltube.com/video/143fd8ba24e44b1ba80a/Bill%20Nye%20Storms, Rubric-1 per student, Household items to build models (will vary by group, ex. Empty paper rolls, boxes, construction paper, tape, glue, etc.)

Modifications:

Extra modeling of research skills may be shown. Extra books to help research may be added. Assistance reading books for research or websites will be allowed. Using text to speech on websites that allow it is acceptable.

Engage:

We have been discussing weather and how it is a part of our everyday lives. We are going to shift focus now onto how you can help with a weather problem. First, we are going to watch a video to get our thinking caps on. The start of this activity will include viewing a Bill Nye video on Storms. After the video a discussion on what weather hazards are will take place, having the students brainstorm what some ideas of them are.

Explore:

The video we just watched was about some of the weather hazards we experience. Who knows what a hazard is? I want you to brainstorm with your table group about some other weather hazards that happen around the world. Allow the students about five minutes to brainstorm and then start writing their ideas on the board. Add any that you feel they may have skipped that could be an option for their assignment (ex. Monsoon, blizzard, hurricane, cyclone, tornado, etc.)

Explain:

You are going to be working in groups to design a safety item for a specific weather hazard. You will be working with your table groups to research, design, and build either an improvement, or a new weather hazard safety item. First your groups must decide on a weather hazard and the climate it is most found in. Based on what we have talked about weather, who can tell me what climate is? You will then research the area to learn why it is an issue there, what

is currently being done to keep the area safe, and how your design will improve or create a new solution to the problem. When I say, you are going to design something, what do you think of? What do you know about engineering? We are going to use the Engineering Design Process. You will come up with an original idea to a problem, then you will create a drawing (blueprint) of your design, and then you will create a model of your solution.

You are going to be taking the science you have learned and applying it to provide a solution to a real-world problem. This can help you in the future, not only by learning to think through and solve problems, but it will make you aware of safety hazards and how to stay safe.

You will receive a checklist and a rubric to know how to begin your project. We will have two check-ins before you begin building your design. You will be given time each day for two weeks to finish your project. Once you have built your final product, you will present your information to the class and how you came to see your solution as an appropriate solution. Any questions? Hand out the checklist and rubric one at a time. Go over any questions students may have prior to letting them start their group work.

Expand:

Students will have two check-ins scheduled on their checklist. They must receive a teacher signature to progress past the check-in stage. The students will be in groups of four so there should be six to seven groups. During the first several days I would suggest monitoring students by visiting with each group for a few minutes a day. This will allow you to answer any questions and keep track of group progress.

In the beginning, I would also suggest the students do research separately so they can write their ideas down in their science notebook. This way they can keep track of their current ideas and present them to their group for a decision. Then the group can use their separate

research to verify the information they have is correct and use it in their presentation.

The vocabulary they come across along the way will be their job to report on during their presentation. The rest of the class should write any new vocabulary they get in their science notebook.

Some suggested final products could include: a new design for a levee, an improvement on the efficiency of loading sandbags, earthquake/tornado proof housing, etc. The designs can be a wide array of things. Since the students are creating something new, or improving something existing, I think there will be a lot of variety.

Evaluate:

The students will be assessed on their final product. They will create a presentation and show the class their 2D drawing and 3D model. They will be assessed on not only the creation, but also the presentation of their research. They must describe what they learned about the climate/hazard and how their safety solution will prevent damage from the hazard. They will be responsible for explaining how their design will work in the real-world and be able to answer any questions classmates have about their design. They must also follow their checklist and stay on task during the two weeks.

Appendix C:
Data Collection Sheets

Weather Stations

Fog

Names: _____

_____

1. Describe what happened in your jar.

2. Why do you think this happened?

3. Where do you think fog forms?

4. What is another type of fog we read about in class?

5. What type of fog did Chewandswallow have in Cloudy with a Chance of Meatballs?

Weather Stations

Dew and Frost

Names: _____

_____

1. What did you see happen in can 1?

2. What did you see happen in can 2?

3. Explain how the two cans reacted the same way.

4. Why do you think the reaction in can 1 happened?

5. Why do you think the reaction in can 2 happened?

Weather Stations

Low Pressure Front

Names: _____

_____

1. What does a meteorologist do?

2. What is a forecast?

3. Draw the three types of clouds.

4. What other jobs are linked to weather?

Weather Stations

Measuring Temperature and Damage

Names: _____

_____

1. On your bar graph of Town X, what day was the hottest and what day was the coldest?

2. What is the difference in temperature from the hottest day to the coldest day?

3. Using your line graph, was it warmer in Town X or London for the week we checked temperatures?

4. What is the difference between the coldest day in Town X and the coldest day in London?

5. What city had their temperature drop to 62 degrees and what day was that?

6. On the Fujita scale, what would the highest amount of damage be called?

7. What F# would it be if the wind speed was 113-157?

8. In a tornado, where would you go to stay safe?

Weather Stations

Water Cycle

Names: _____

_____

1. What is happening in the baggy?

2. Using your water cycle books, describe what is happening in the baggy.

3. What are the three main parts of the water cycle?

4. Use your weather words book to list the three types of precipitation.

Weather Stations

Challenge

Names: _____

_____

1. Put a small amount of hand sanitizer on your hands. Your hands are now wet, how do they feel?

2. How long did it take for your hands to dry?

3. What part of the water cycle do you believe this reaction is?

4. Put a small amount of hand sanitizer on your hands again. This time wave your hands in the air. How do your hands feel now? Is that different from the first time?

5. Why do you think that happened?

6. Do you think this is a cooling or warming process?

Appendix D

Persuasive Destination Project Rubric

	Graph	Brochure/Poster	Report
3	Graph is complete with weather information for 15 days	Brochure/ Poster is complete and lists weather recorded, 3 interesting facts, and 3 locations trying to persuade the reader to visit.	The report lists the climate in the area, 5 facts about the area, and 5 locations of interest near the destination.
2	Graph has 1-3 missing days of weather.	Brochure/ Poster is complete and lists weather recorded, 2 interesting facts, and 2 locations trying to persuade the reader to visit.	The report lists the climate in the area, 4 facts about the area, and 4 locations of interest near the destination.
1	Graph is missing 4-6 days of weather	Brochure/ Poster is complete and lists weather recorded, 1 interesting facts, and 1 location trying to persuade the reader to visit.	The report lists the climate in the area, 3 facts about the area, and 3 locations of interest near the destination.
0	Graph is missing more than 6 days of weather	Brochure/ Poster is complete and lists weather recorded, 0 interesting facts, and 0 locations trying to persuade the reader to visit.	The report lists the climate in the area, 0-2 facts about the area, and 0-2 locations of interest near the destination.

Appendix E:

Final Project Checklist

Weather Hazard Safety Design Checklist

- Weather Hazard Selected by Group
- Climate selected by group
- Research the Hazard and Climate using books and internet sources
- Meet with teacher to describe research conducted so far
- Signature to move forward _____
- Research current Hazard solutions
- Create new solution or improve on an existing one
- Meet with teacher to discuss your group's ideas for a solution
- Signature to move forward _____
- Create a design on paper of your safety solution on
- Create your safety solution as a model in 3D using household items
- Create a presentation of the information collected and evidence that your solution would work

Appendix F:
Rubrics

Final Project Rubric

	Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. Your group must be able to demonstrate how your solution would work against the hazard.	Describe the climate of your chosen region and how that changes over the year.	Define your hazard and its impact it has on your chosen climate region	Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones).	Access information efficiently (time) and effectively (sources)	Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts

3	The claim made about your group's design solution effectively describes how it will work against the chosen hazard.	The group describes their climate over the year in detail with no omissions .	Your group describes your hazard and the impact it has on its chosen climate region in detail.	Your group created a 3d model of a new solution or improved solution to your chosen weather hazard after creating a 2d drawing of your solution idea.	Your group could complete each task on the checklist on time.	Your group created an effective presentation of the climate region, hazard, and hazard solution.
2	The claim made about your group's design solution describes how it will work against the chosen hazard but with omissions of information.	The group describes their climate over the year, but with omissions in detail.	Your group describes your hazard and the impact it has on its chosen climate region but lacks details.	Your group created a 2D drawing of a new solution or improved solution to your chosen weather hazard but didn't make a 3D model.	Your group could complete each task on the checklist but had an issue with time.	Your group created a presentation of the climate region, hazard, and hazard solution that lacked some detail.

1	The claim made about your group's design solution does not describe how it will work against the chosen hazard.	The group describes the climate, but not how it changes over the year.	Your group describes your hazard, but does not describe how it impacts the climate region.	Your group created an idea for a safety solution to your hazard but were unable to made a 2D drawing or 3D model of your idea.	Your group had difficulty staying on task and was unable to complete the checklist.	Your group created a presentation that lacked the inclusion of either the climate region, hazard, or hazard solution.

Appendix G:

Parent Letter Home

Dear Parents,

We are about to begin our Weather and Climate Unit. In this unit your child will learn and do the following:

1. about weather and climate in different regions of the world
2. about jobs associated with weather and climate
3. the water cycle, and how we always have the same amount of water on Earth
4. how resources like water are not equally distributed on Earth
5. extreme weather
6. creating graphs based on daily weather
7. creating a travel brochure to a destination of their choice
8. creating poetry using new weather vocabulary
9. creating a solution to a weather related problem
10. solving math problems using weather information
11. creating a mixed media project
12. creating a foodamil
13. comparing and contrasting *Cloudy with a Chance of Meatballs*

Some of these projects will require things from home. Your child will need to bring in some items from home, of their choosing. Some suggestions are paper towels rolls, toilet paper rolls, string, etc. These are to be items from home and not something that needs to be purchased. They may start bringing things in for their projects whenever they choose. If you are unable to find things please let me know as I will try to have some available. If you have any questions please let me know! Thank you,

Appendix H:

ABCs of weather, weather dictionary

ABCs Of Weather

Word	Definition
A	
B	
C	

Word	Definition
D	
E	
F	

Word	Definition
G	
H	
I	

Word	Definition
J	
K	
L	

Word	Definition
M	
N	
O	

Word	Definition
P	
Q	
R	

Word	Definition
S	
T	
U	

Word	Definition
V	
X	
Y	

Word	Definition
Z	

Appendix I

Books Used/Available for Student Access

Barrett, J. (1982). *Cloudy with A chance of meatballs*. Atheneum Books for Young Readers.

Black, S. W. (2023). *The water cycle*. Children's Press, an imprint of Scholastic Inc.

Callery, S. (2014). The magic school bus presents: wild weather. Scholastic.

Canavan, R. (2014). You wouldn't want to live without clean water! Franklin Watts, an imprint of Scholastic Inc.

Canavan, R. (2015). You wouldn't want to live without extreme weather! Franklin Watts, an imprint of Scholastic Inc.

Caputo, C. A. (2011). Weather and climate. Scholastic Inc.

Crane, C. (2023). Protecting Earth's waters. Children's Press, an imprint of Scholastic Inc.

DePaola, T. (1975). The cloud book. Holiday House.

Furgang, K. (2012). Everything weather: Facts, photos, and fun that will blow you away. National Geographic.

Gibbons, G. (1990). Weather words and what they mean / Gail Gibbons. Holiday House.

Herrington, L. M. (2023). What is water? Scholastic Inc.

Hooper, M. (1998). The drop in my drink: The story of water on our planet. Viking.

Hopkins, L. B. (1994). *Weather - poems for all seasons*. HarperCollins Publishers.

Jacoby, J. (2019b). Meteorology activity book: Packed with activities and Meteorology Facts. Racehorse for Young Readers, an imprint of Skyhorse Publishing, Inc.

Korb, R. B., & Reibeling, B. (2008). The wild water cycle. Magic Wagon.

Mann, D. L. (2023). How you can save water. Scholastic Inc.

McKinney, B. S. (1998). A drop around the world. Dawn Publications.

Osborne, W. (2003). Magic Tree House Research Guide: Twisters and other terrible storms: A nonfiction companion to twister on Tuesday. Random House.

Parker, J. (2000). The Science of Weather. Gareth Stevens Pub.

Purslow, F. (2011). The water cycle. AV2 by Weigl.

Relf, P. (1996). Wet all over: A book about the water cycle. Scholastic.

Robertson, K. (2014). Stem guides to weather. Rourke Educational Media.

Smyth, J. (Ed.). (1989). Questions kids ask 20: About weather. Grolier Limited.

Snedeker, J. (2012). The Everything Kids' Weather Book: From tornadoes to snowstorms, puzzles, games, and facts that make weather for Kids Fun! Adams Media.

Stoller-Conrad, J. (2021). Weather Experiments Book for kids: More than 25 hands-on activities to learn about rain, wind, hurricanes, and more. Rockridge Press.

Strauss, R. (2007). One well: The story of water on Earth. Kids Can Press.

Appendix J:

Reviewers Comments

Reviewer 1

Strengths in lesson plans

1. Very well thought out with links to other content areas:
    a. Books to read aloud, which links literacy to science and then have a follow-up activity to go with the book. This helps them focus and comprehend what is being read aloud
    b. Graphs to make, this links to how science and math work together.
    c. The art media project and brochure to make is fun and imaginative for students to plan and present.
2. Your use of technology with research being done to answer questions and using See-Saw to involve parents, as well as You Tube videos is wonderful
3. Using observation of weather in their home state of Iowa, makes them see science is a part of their own daily life.
4. Excellent notation of your lessons corresponding to the Iowa Science Core Standards.

Weaknesses in lesson plans

1. Differentiation for poor readers and writers (special education or Title reading students). Can they write less, or present orally? You have a variety of ways for students to provide understanding of the objective being taught, which is very good, however, maybe some students are not very good at art, how can you help them provide the end result you are looking for?
2. Can you provide rubrics to show the level of meeting your criteria for assignments for assessment purposes?
3. You have some long-term projects, how are students going to organize and save their projects? Where will they store and have access to them?

Adaptations needed based on your teaching experience.

Reviewer 2

Strengths in lesson plans

5. Extremely engaging :)
6. Detailed
7. Good variety within the lessons, book, videos

Weaknesses in lesson plans

4. SPED accommodations?
5. Make sure the students know good websites when researching.
6.

Adaptations needed based on your teaching experience.