

Planning Commentary

February 28, 2021

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Practicum 3

Central Focus

In this lesson plan series, students will focus on obtaining, evaluating, and communicating information to show how Earth's surface is formed. According to the disciplinary core ideas, some changes in the Earth's crust are abrupt like earthquakes and volcanic eruptions, while other changes happen very slowly such as the uplifting and wearing down of mountains.” Students will construct an explanation of how the movement of lithospheric plates, called plate tectonics, can cause major geologic events. Students will learn how the convection currents in the mantle cause the lithospheric plates to move. Applying the cause and effect of this phenomenon of tectonic plates will give evidence of the movement of the tectonic plates to create divergent boundaries, convergent boundaries, and transform boundaries. An alternative cause of plate movement is the dipping of the plate into the mantle, leaving a massive gap in the Earth’s crust.

With the central focus being on the lithospheric plates, students will learn how to identify and explain how lithospheric plates are formed. Additional knowledge learning targets include the ability to explain the theories of plate tectonics, continental drift, and seafloor spreading. Within this lesson, students will have the ability to list and identify the three main types of plate boundaries, including divergent margins, convergent margins, which include collision and subduction zones, and transform margins. Students will be able to apply their knowledge to locate the various plate margin boundaries to identify spatial patterns on the world map. The final two knowledge targets that apply to the scientific concepts of plate tectonics will teach the students how to identify and describe the types of geological events that occur at plate boundaries which includes seismic in volcanic activity. Students will gain knowledge of the cause-and-effect relationship between convection currents in the mantle and plate movements at the surface. Cross-cutting concepts teachers that phenomenon may have more than one cause in some cause and effects relationships in systems can only be described using probability. The Science and Engineering practices highlight how the cause-and-effect relationships may be used to predict phenomena in natural or design systems. Stability can be disturbed by gradual changes that accumulate over a period of time, or the change could happen suddenly. The knowledge target represents conceptual understandings for students to learn to support the disciplines and understand information about geological events.

Understanding the real-world phenomenon of the interaction of tectonic plates to cause geological events such as earthquakes and volcanoes will allow students to understand the reasons why these

events occur. Students will use technology to develop these reasoning targets when constructing an explanation of these events that can be catastrophic to humans and humankind, including the destruction of buildings.

The science and engineering practices that are relevant to this lesson include constructing explanations and designing models or representations of tectonic plates. Students will be it will be allowed to draw the various boundaries and zones in a Nearpod lesson. Students also will have the opportunity to gather read synthesize information from multiple sources to describe how they are supported or not supported by evidence. The application of the scientific process is through inquiry will be supported throughout the lesson add the students learn to make predictions on the real-world phenomenon been using data from previous earthquakes and volcanoes. Students will be taught to apply scientific reasoning based on the data and the evidence they gather for the first time and utilize a quick right to draw a conclusion.

The vertical progression from fifth-grade science since the foundation of obtaining evaluating and communicating information to identify features on the Earth caused by constructive and/or destructive processes. Students learned in element a to identify surface features such as volcanoes that a constructive or destructive process could cause. A pre-assessment was given for the unit prior to unit 3.1. This assesses the student's prior knowledge of the information learned in fifth Grade. The Georgia Standards for 6th Grade connects the layers of the Earth from unit 3.1 two the tectonic plates in unit 3.2. As the students have learned about convection currents in the atmosphere and convection currents in the oceans, the prior knowledge will transfer to the uprising of convection currents in the Earth's mantle. The teacher will make the connection between the relationships of heat rising and causing convection currents in various places of the Earth. Each lesson plan builds upon the other. Starting with a spark of the phenomenon of geologic structures in Georgia comparing them to geologic structures in other parts of the United States, students notice the difference in the land features and make connections to movements of the tectonic plates. The student initially learns how the tectonic plates move and the vocabulary connected with the unit on day one. Students can participate through technology to understand the relationship between the scientific concepts and the direction of the moving of the tectonic plates.

On day two, students are asynchronously exploring reinforcing material and getting a check for knowledge and understanding. Students with IEPs or 504 plans, English language learners, struggling readers, underperforming students, or those with gaps in academic knowledge will receive differentiated material to support their learning. Strategies that are used include audio, literacy strategies and reading, and chunking the text. The knowledge of the students is used to inform instruction by repeating instructions multiple times, simplifying the scientific terms, and allowing extra time for students to complete the task. The repetition of the concepts reinforces students. Differentiation occurs by interest, readiness, learning profile environment, and particular learning style (Tomlinson and Tonya R. Moon, 2013). The scientific concepts will be described in a way that connects to the student's cultural backgrounds and their suburban community of Conyers, Georgia. Our class does not include gifted students, but more recently, there have been a few standouts. However, one lesson assignment is planned as an extension that has not yet been utilized.

On the third day of the synchronous Lesson plan, students will participate in an argument-driven inquiry (ADI) lab. The lesson will use the vocabulary of the previous two days to reinforce the students' knowledge. ADI LAB 6 helps students understand the plate boundaries and connection to hazards. Within the lab, students will investigate locations of the phenomenon of earthquakes and volcanic eruptions by engaging in scientific practices through inquiry and correlate them to the fault lines along the boundaries of tectonic plates. Students will use the theory of tectonic plates to develop an argument for or against the theory. A writing assignment instructs students to construct an explanation of the phenomenon and make predictions based on data retrieved from websites. Theories are used in science to construct explanations on how the world works. According to Paul Anderson (2020), science and engineering practices are designed to help students understand how the universe and the phenomenon in it operate.

Knowledge of Students to Inform Teaching

Students that live in this suburban area do not travel more than 10 miles on average from their home. When questioned about family travel and places that they have visited, students will state that they have not been there. During the unit on Weather, students were asked if they had been to a Braves game. There were no students who indicated that they had attended games in Atlanta. Many students were not interested in sports. This phenomenon introduction was not effective as no prior knowledge connection was established. Knowing this, the focus is on the phenomena that can be found within their neighborhood or in closer proximity. Referencing Stone Mountain Park and the minerals and rocks that are located there build on their interest in Geoscience. One assignment from Unit 3.1. focus on students to a rock hunt around their home. Students of varying abilities can search for minerals and rocks around or near their homes. Some students must even be encouraged to venture out a little further or take the weekend to search. Latinx students have a love of the outdoors. Students with learning disabilities can make better connections when using tactile senses, like finding and touching rocks and using various strategies that include reading, closed captioning, placing snips in the chat, and repetition.

The introduction of earthquakes and volcanoes will spark the interest of students, much like disaster movies and daily news. "Because the phenomena in science are in motion, it tends to be an attention-getter (Ormond, 2020)." Bringing in the central focus and the learning targets of why these disasters happen will spark interest and "move the knowledge from working memory to long term memory." Students are still learning to think for themselves and to develop arguments using evidence. Lesson 3 will allow the student "to explore the empirical nature of science" and discuss earthquakes and volcanoes' data in relation to the tectonic plate movement (*Tenets of the Nature of Science*, n.d.).

From the first semester, the focus of developing a community of learners where encouragement was a central theme and supporting individual uniqueness was accepted. This has been an exceptional strategy for this diverse group of learners from diverse cultural backgrounds. Hubert (2014) takes into consideration the student perspective of culturally relevant pedagogy (CRP).

Students who had experience CRP in mathematics classrooms were interviewed; Hubert (2014) found at the conclusion of her study the students had an “improved attitude and/or interests towards learning. The creation of a home environment in the classroom concept gives these students a sense of belonging in the classroom. When a caring teacher is encouraging, supportive, and positively affirming, students feel the other students' love and respect. When students love and support gives a feeling "like family", the performance in the classroom can be enhanced. "Continually encouraging the classroom culture of acceptance of differences shared cultural experiences, and excellence in learning, I feel, increase the student confidence to join in/engage the scientific discussion.

Consequently, students are encouraged when they read or really try hard to answer a question. Upon prompting, the entire class is asked to "give the student a hand clap for being brave enough to speak on camera.” Ladson Billings reported that many of the teachers hired in lower-class schools have unimaginative teaching, low expectations, and are using substandard textbooks. Studies show that when there are opportunities to improve a child's experience in school, we can improve or reverse the outcome of his slash her life. Treating the students as competent increases the likelihood of compliance (Ladson-Billings, 1997).

Supporting Students' Science Learning

The students in this fourth-period class have various accommodations such as extended time for testing, behavioral considerations and medical challenges, and psychological diagnosis. The students are lively and like to talk and express themselves. Due to attention deficit disorders and accommodations that require breaks, students are supported by using multiple engaging activities. Classroom discussion is utilized to gauge students' understanding of the concepts and terms.

Engaging students in active learning through relevant and timely class discussions allow for student participation and interaction with key concepts and skills. The teacher actively monitors students' progression and participation. The students have been grouped and tracked into this fourth-period class so that their learning styles and learning abilities can be grouped together. Students are tracked into this class, as evidenced by being part of the SWD (Students with Disabilities) Team, as stated by the Principal. The student's personalities are amiable, and that is utilized to create a new encouraging environment. The applied behavior analysis (ABA) research theory is utilized as a technique to change the behavior of groups of people in this classroom (Ormond, 2020). The group contingency strategy works particularly well as an intervention with this group of students as a reinforcement for academic success.

The community asset mapping project researching the High School and Middle School in our area revealed the lack of community support with after-school programs, which would have reinforced learning in the community. The low income in single-parent households also affects the learning of the students. Many of the students are on free lunch, live surrounded by a food desert, and participate in other government-supported programs. Meetings with parents reveal students who

have been adopted, students who are required to assume adult roles in their household, and care for younger children. Therefore, these students entering the 6th-grade lack cognitive ability yet have had to model adult behavior. Research shows that “people can learn by observing others’ behaviors and the consequences that result (Ormond, 2020)”. According to the teacher's TEKS Walk-Through, the classroom has a well-managed and orderly working-class environment; the students frequently participate through volunteering and when called on. In the classroom, the teacher consistently models correct student and teacher behavior and encourages all students' respect. This is not the case in many of the students' home environments exhibited by blurting out, lack of following rules, and challenges following directions. The modeling and describing good note-taking skills and effective study habits to the students to support underperforming students, those with gaps in academic knowledge, struggling readers, or English language learners as individuals and groups with specific learning needs.

The instruction will identify misconceptions and preconceptions connected to plate tectonics through the use of Keeley Probes (Uncovering Student Ideas) and the Rockdale County Curriculum Planning Guide that explicitly challenges misconceptions the whole group. According to The Rockdale County Instructional Planning Guide, there are four significant misconceptions throughout the County by 6th-grade students. Identified below are the common preconceptions within the central focus of plate tectonics and the corrections that will be addressed within this lesson planning segment.

Plate Tectonics

1. ***Misconception: The world map is unchanging; or a major change - such as California separating from North America - could happen within my lifetime.***

Correction: Moving plates cause major changes in a world map over tens of millions of years.

2. ***Misconception: Earth has always looked as it does now; Earth began with a supercontinent called Pangaea, which broke up to make the present continents.***

Correction: Pangaea was the most recent of a succession of supercontinents that have formed and broken up over time.

3. ***Misconception: The mantle is molten everywhere; volcanoes happen whenever the crust is thin enough for magma to breakthrough.***

Correction: The mantle is solid but capable of flow (like hot asphalt or fudge). Only under special conditions (at hot spots and along plate boundaries) does the mantle or crust melt to make magma, which may then rise to the surface to make a volcanic eruption.

4. ***Misconception: Earthquakes are random spasms in the Earth that suddenly create major crustal features.***

Correction: Earthquakes represent sudden breaks in crust continuously stressed by plate movement.

Pangea Example

Students are still learning to think beyond their current environment. Earth Science is an expansive field that pushes beyond the normal to the exciting world yet to be discovered. The unit on plate tectonics causes the students to build imaginations to visualize what is happening beneath their

feet. Videos are shown to stimulate the sensory images, including the visual images necessary to communicate with long-term memory. Students have many misconceptions about correct scientific principles. One of the most recent misconceptions to be cleared up during this unit is the explanation that fossils of the Lystrosaurus have been found in three different continents. Four out of six students have a misconception that the slow-moving, plant-eating reptile drifted on rafts of vegetation from one continent to another. This will inform the teaching of the existence of Pangea to the students.

Monitoring Student Learning

Each lesson in the series has learning objectives that address the scientific concepts. According to Rockdale County's Assessment Blueprint, the depth of knowledge (DOK) level ranges from one to three on the standard element (S6E5.f.) as published by GA DOE. The proportion of items on the assessment is divided as follows DOK 1 is 30%, DOK 2 is 45%, and DOK 3 is 25%. The Common Unit Assessment (CUA) blueprint for unit 3 point 2 has a total number of items of 20, in which ten of those will be focused on the standard element S6E5.f.

The assessments are chosen because they are grade-level appropriate and are a challenge for 60% of the students in the class based on past task completion. The students have Lexile Reading levels ranging from 3rd Grade to 5th Grade. For lesson 1, students will begin with a pre-assessment of their knowledge of tectonic plates by completing an uncovering student ideas probe - Describing Earth's Plates. Two or three students will be selected to explain their thinking to describe tectonic plates after the class completes the worksheet. This assessment will not be counted as a grade. "Probes, that can reveal what your students already know—or think they know—about core Earth and environmental science concepts. (Keely, 2020)". Armed with those insights, one can use the probes to adjust the approach to teaching and present the science so students will learn the content accurately (Keeley, 2016).

The subsequent Nearpod lesson has multiple assessments in bedded within the lesson. The teacher has the ability to see the work in real-time to assess student's knowledge. The teacher can make real-time adjustments to the specific learning needs of the students. The students who are exceptional learners will be allowed more time to complete the tasks. Directions will be repeated multiple times, and attention will be called into focus for students who have attention deficit disorder. The students are active learners who love to participate and communicate their thoughts during class. Reports are available on the Nearpod website for the teacher to retrieve the scores once this activity is completed. The assessment plan is adapted to diverse learners to keep them engaged by using a variety of technology that allows for differentiation in real-time instruction. Struggling readers are assisted by the teacher reading the instructions aloud or asking for student volunteers to read.

The final formative assessment on how they learned includes a revisit of the uncovering student ideal probe, also known as a Keeley probe. The students are asked to complete this assessment that will count as a grade to demonstrate their learning of the real-world phenomenon of tectonic plates.

From an informal survey taken of students, an understanding was developed that the students' learning patterns are incredibly varied. The students with IEP's understand that they have challenges focusing and may need to repeat watching the video independently. Placing a video link in the chat will allow access at a later time. The planned assessments are designed to be manageable by diverse learners, engaging while using familiar technology to complete the task. The students are only able to utilize two or three different applications during one class period. The lesson segment is designed to keep attention focused on science and keep distractions at a minimum. Streamlined approaches have been developed based on the learning targets to deliver information to the class. Allowing the concepts from the depth of knowledge level 1 to gradually build between common formative assessments to the depth of knowledge Level 3 throughout the learning segment has proven in the prior Common Formative Assessment (CFA) to improve students test scores and learning. "This process of combining pieces of information in some way called chunking, can slightly increase the amount of information that working memory's limited space can hold (Ormond, 2020, 176)".

On day two of the lesson plans series, students will be assessed on their knowledge of earthquakes by completing a seven-question Study Jams Test Yourself. Students will receive immediate feedback through the automatic grading system within the Explore Learning website. Although this is an asynchronous assignment, the reports will show patterns in misconceptions from the lesson.

As the assessments build to the third day, the teacher will assess the students learning while reinforcing with a video with embedded questions. This assessment will give it a quick check for understanding plate tectonics again using technology with the virtual students. The teacher will continuously monitor the students as they participate in the activity and use the data to adjust direct instruction. After the opening, students will participate in a class activity where they will demonstrate their understanding of the movement of the Earth causing geologic events. Finally, the post-assessment is a Quick Write that assesses student's ability to construct an explanation of the movement of the lithospheric plates. This will show mastery of the standard and assesses students the literacy abilities in the science classroom. The final assessment for Unit 3 is a CFA (Common Unit Assessment), a summative question answer response that will be administered after this unit is the RCPS 6th Grade Science CUA Unit.

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Activities Referenced in Lessons

Lesson Plan 1

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Lesson Plan 2

- Study Jams [Earthquakes](#) and Plate Tectonics Retrieved from <https://studyjams.scholastic.com/studyjams/jams/science/rocks-minerals-landforms/earthquakes.htm>
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