**University of Arkansas**

**College of Education**

**Lesson Plan Format**

**COE Course**

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| **Unit Title:** Earthquakes and Volcanoes | **Lesson Title:** Modeling earthquakes |
| **Subject Area:** Science | **Grade Level:** 6th Grade |

1. **Pre-assessment and Planning**
	* Students have been previously instructed about plate tectonic theory and the different types of plate boundaries.
	* The students went on an earthquake field trip on Feb 3,2014, and received instruction on the effects of earthquakes, and the locations of earthquakes and volcanoes earlier in the week.
	* Four models are being used. The 7 table groups will be melded into four groups. The smaller population tables will be divided evenly between the other tables in such a manner as to keep the ability groups evenly distributed.
	* The #1 person from each of the new groups will get an earthquake model from the circle table. The #2 person will gather the weights from the sink area. The # 3 person will gather the paper and marker from Mr. Bogdon’s area.
	* Mrs. Morgan will be available to help guide the activity.
2. **Objective(s)**
* I can develop a hypothesis on how often earthquakes occur and justify my hypothesis with experimentation.

ESS.8.6.13 Analyze how earthquake occurrences are recorded (seismograph) and measured (Richter Scale). Students will use this inquiry-based lab to lead into Friday lesson on seimographs and the Richter Scale.

1. **Assessment**
* Students will prepare individual lab reports within their science notebooks during and after the brick and bungee experiment. The work will be evaluated using the rubric in this section. The grade will be a calculated percentage from the rubric that will be converted into a whole number value for the grade book.
* Student learning will be determined by analyzing their conclusions to look for critical thinking that draws upon their experimental experience and their prior knowledge. Individual feedback will be annotated upon the lab report within their science notebook.
* This lab activity is intended to be an inquiry based lab to determine how often earthquakes happen in fault zones. Students will be working in heterogeneous cooperative groups to execute the activity.
* The results of this lab will guide the introduction to the next science lesson. If there is a wide spread misconception (only 70% students understand the concept), extra time will be devoted to developing the content knowledge.

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| Lab Report : Brick and Bungee experimentTeacher Name: **Mr. Bogdon** Student Name:     \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| CATEGORY | **4** | **3** | **2** | **1** |
| **Journal/Notebook** | Clear, accurate, dated notes are taken regularly. | Dated, clear, accurate notes are taken occassionally. | Dated, notes are taken occassionally, but accuracy of notes might be questionable. | Notes rarely taken or of little use. |
| **Experimental Hypothesis** | Hypothesized relationship between the variables and the predicted results is clear and reasonable based on what has been studied. | Hypothesized relationship between the variables and the predicted results is reasonable based on general knowledge and observations. | Hypothesized relationship between the variables and the predicted results has been stated, but appears to be based on flawed logic. | No hypothesis has been stated. |
| **Scientific Concepts** | Report illustrates an accurate and thorough understanding of scientific concepts underlying the lab. | Report illustrates an accurate understanding of most scientific concepts underlying the lab. | Report illustrates a limited understanding of scientific concepts underlying the lab. | Report illustrates inaccurate understanding of scientific concepts underlying the lab. |

1. **Engaging the Learner**
* Present three different hypothesis about earthquake occurrences and ask the class to go to different corners of the room representing the different options.

**Inquiry:** How can we predict the occurrence of earthquakes?

* + **Hypothesis 1:** Earthquakes are periodic (in other words, all of the same slip, and all separated by the same amount of time). There is some evidence for this, particularly among very small earthquakes on creeping faults.
	+ **Hypothesis 2:** Earthquakes are 'time-predictable' (this means that the larger the slip in the last earthquake, the longer the wait until the next one.) This idea was formulated in the 1980's by Shimazaki and Nakata in Japan, and has been widely used.
	+ **Hypothesis 3:** Earthquakes occur randomly in time and and have randomly varying size. (This 'Poisson' hypothesis is also widely used, particularly when little information about a fault and its past earthquakes is available).
* Communicate expectations, procedures, and routines that will keep students engaged in learning. Emphasize safety and the scientific process.
* Connect future learning to past knowledge by reminding students of what they have learned about earthquakes this week.
1. **Methods, Activities and Resources**

**Methods**

* Scaffolding
	+ Modeling different hypothesizes and the execution of the lab activity
* Potential classroom management concerns
	+ Excessive noise levels or inattentiveness due to slightly overlarge group –Two teachers are on hand to moderate noise levels. Students will be reminded that the lab reports are individually evaluated.
	+ Movement hazards- Movement to get and transport materials will be limited to designated personnel.
* Closure
	+ Review of lesson referring to the objectives
	+ Compare classroom data between groups
	+ Solicit summary of learning from students/feedback to students while trying to connect to future learning and real-world experiences
	+ Preview of next lesson on measuring earthquakes using seismographs and the Richter scale

**Activities**

* Engaging the learner, comparing the hypothesis (3 minutes)
* Connecting learning, outlining expectations, and modeling the lab (3 minutes)
* Breaking into groups and gathering materials (5 minutes)
* Lab activity as a group (30 minutes)
	+ Hypothesizing the prediction of earthquakes.
	+ Analyzing results of experimentation.
* Conclusion and connecting to future lessons, turning science notebooks in for assessment (9 minutes)

**Resources**

* Brick and bungee earthquake models, four. (Safety briefing required)
* Computer, internet access, document camera, and a projector
* Table handout.
* Paper, ruler, and pencil

**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Inquiry**: How can we predict the occurrence of earthquakes?

**Personal Hypothesis**:

***1..****Perform two trials using the brick on the sandpaper. Record the distance (in centimeters) moved after each listed amount of turns or revolutions of the crank handle.*

***2.****Perform two trials using the brick on the talc. Record the distance (in centimeters) moved after each listed amount of turns or revolutions of the crank handle.*

***3.****Perform two trials using the two bricks (linked together) on the sandpaper. Record the distance (in centimeters) moved after each listed amount of turns or revolutions of the crank handle.*

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| Brick and Bungee Lab |
|  |  |  |  |  |  |
| **1** | Distance Moved (cm) |
| Type of Fault Scenario | 3 turns | 6 turns | 9 turns | 12 turns | 15 turns |
| High Friction |   |   |   |   |   |
| High Friction |   |   |   |   |   |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| **2** | Distance Moved (cm) |
| Type of Fault Scenario | 3 turns | 6 turns | 9 turns | 12 turns | 15 turns |
| Low Friction |   |   |   |   |   |
| Low Friction |   |   |   |   |   |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| **3** | Distance Moved (cm) |
| Type of Fault Scenario | 3 turns | 6 turns | 9 turns | 12 turns | 15 turns |
| Stress Redistribution |   |   |   |   |   |
| Stress Redistribution |   |   |   |   |   |

**Analysis:** *Interpret your results.*

**Conclusion:** *Was your hypothesis correct or incorrect according to this experiment?*

1. **Potential Adaptations to the Lesson {PAL}**
* If there is a technology failure I will utilize the white board to illustrate any directions that would be unable to be given.
* If time is cut short, the lesson will be redirected to Friday. Students will take self-reading notes in their science notebooks from pg.228-232.
1. **Collaboration**
* The lesson plan will be reviewed by my mentor and university supervisor.