**Subject area/course**: Science/Physics

**Grade level/band**: 10-11

**Task source**: Summit Public Schools

**Wave/Sound CER (Claim Evidence Reasoning) Essay**

**TEACHER'S GUIDE**

1. **Task overview**:

In this task students will perform an investigation to determine if sound or light is a mechanical wave. To accomplish this, students will:

1. Determine the criteria for what makes something a mechanical wave.
2. Participate in an exploratory lab to collect evidence of the nature of sound/light.
3. Use their evidence to write a claim about the nature of sound or light.
4. Write a five paragraph persuasive essay to support their claim.
5. Go through a feedback and revision cycle to turn in the highest quality project imaginable.
6. **Aligned standards:**
7. **Common Core State Standards**

CCSS.ELA-Literacy.RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CCSS.ELA-Literacy.WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCSS.ELA-Literacy.WHST.9-10.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

1. **Critical abilities**

Analysis of Information: Integrate and synthesize multiple sources of information (e.g., texts, experiments, simulations) presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to address a question, make informed decisions, understand a process, phenomenon, or concept, and solve problems while evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Experimentation and Evaluation**:** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. Evaluate hypotheses, data, analysis, and conclusions, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Interpersonal Interaction and Collaboration: Develop a range of interpersonal skills, including the ability to work with others, to participate effectively in a range of conversations and collaborations.

Use of Technology:Present information, findings, and supporting evidence, making strategic use of digital media and visual displays to enhance understanding. Use technology, including the Internet, to research, produce, publish, and update individual or shared products in response to ongoing feedback, including new arguments or information.

1. **Next Generation Science Standards**

[MS-PS4-1](http://www.nextgenscience.org/ms-ps4-1-waves-and-their-applications-technologies-information-transfer): Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave,

[MS-PS4-2](http://www.nextgenscience.org/ms-ps4-2-waves-and-their-applications-technologies-information-transfer): Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials

1. **Time/schedule requirements:**

This task will take approximately 1-2 weeks to complete. A sample timeline is below.

* Day 1: Establish criteria for the claim
* Days 2-3: Collect evidence through investigation
* Day 4: Outline argument with claims, sub-claims, evidence, and analysis
* Day 5: Draft the essay
* Days 6-7: Feedback and revision
1. **Materials/resources:**

Documents:

* Item A. Is Sound a Mechanical Wave?
* Item B. Sound Stations
* Item C. Light Stations
* Item D. Stations Graphic Organizer
* Item E. Outlining your Argument
* Item F. Peer Editing Worksheet

Supplies for light stations:

* Heat lamp
* Digital scale
* Flashlight
* Vacuum chamber
* Picture of light that was sent through two openings
* Laser

Supplies for sounds stations:

* Tuning fork
* Rubber stopper
* Bags
* IPod & speaker (or comparable)
* Pan
* Cereal
* Cups connected by string
1. **Prior knowledge:**

None listed.

1. **Connection to curriculum:**

None listed.

1. **Teacher instructions:**

Part 1: Establish Criteria for the Claim

This project can be done with sound or light. There are stations for both in Part 2.

[Item A. Is Sound a Mechanical Wave?]

Part 2: Collecting Evidence through Investigation

This is primarily an interactive exploratory lab. Stations are included for both sound (Item B) and light (Item C). This can also be supplemented with research if students feel they didn’t get evidence for something.

[Item B. Sound Stations

Item C. Light Stations

Item D. Stations Graphic Organizer]

Part 3: Outline of Argument

Use the scaffolded and streamlined outline (Item E), if appropriate. The color-coding lets you say “filling in all YELLOW boxes” first. etc.

[Item E. Outlining your Argument]

Part 4: Drafting the Essay

Part 5: Feedback and Revision

This activity can be a little time consuming and may take an extra day, but it is effective in getting students to really understand how the rubric works.

[Item F. Peer Editing Worksheet]

1. **Student support:**
* Students should work in groups when possible to solve problems or conduct experiments. It is recommended that students work together on the investigation and modeling aspects of this task and then produce the paper individually.
* Provide many hands-on experiences as ELL students learn best by doing and seeing lessons.
1. **Extensions or variations:**

None listed.

1. **Scoring:**

Student work can be scored using the Wave/Sound CER Essay rubric.