

Lesson Plan:

Slingstones in flight:
The physics of a slingstone

Note: If done with students in middle school, this lesson will focus less on calculations and more on general information regarding aerodynamics and momentum; alternative, if done with students in high school, then calculations may be conducted.

Description

In this lesson, students will learn apply knowledge about physics (or for middle school students, momentum) toward understanding the technology used by ancient Chamorros.

Objectives/Skills

- Students will theorize a way to more forcefully throw a fist-sized object.
- Students will then discuss the technology behind a slingstone, and, if in a physics class, conduct some calculations.

Questions or Assessment

- Were students able to recognize the advanced technology incorporated into a slingstone?
- [for physics students] Were students able to conduct calculations based on the parameters of a slingstone.

Procedure

Teacher prep

1. [Optional] If readily available, bring in a slingstone as a visual aid.

Prompting ideas (5 min.)

1. Present students with the following scenario: you are a warrior, and you must prepare for a battle by developing a weapon. You have chosen to throw rocks, because they are abundant. But you find that you can only throw a small, fist-sized rock only so far; and, the velocity with which you throw it is fairly limited by your arm strength. What do you do?
2. List student responses on the board.
 - a. It is highly likely that a student will already be familiar with slingstones and mention it at this time. If so, shift the discussion toward why this student would pick a slingstone; list the stated strengths.

Subjects

Science, Physics

Grade-level

Middle, 6-8

High, 9-12

Time required

30 – 45 min. (depending on the skill-level of students)

Materials required

[Optional] Slingstone

[Optional] Guam flag or seal

Related background reading

None

Related documents

None

Related links

Guampedia

Exploring ancient technologies (15 min.)

1. Describe the problem that ancient Chamorros solved with the slingstone:
 - a. Warriors needed to throw stones further and with more force. They developed this tool to accomplish such a feat.
2. Now ask students how this technology works
 - a. With younger students:
 - i. Focus primarily on a general discussion of the aerodynamics of the stone and the momentum as generated by the sling.
 - b. With more advanced students:
 - i. Compare the momentum generated from a shorter radius (the arm when a stone is simply thrown) to that of a larger radius (the sling when throwing a slingstone).
 - ii. Discuss the elements of momentum, inertia, and force as applicable to this example.
 1. This discussion will vary greatly upon the skill-level of your students.
 2. If students are comfortable with this topic, quickly recap the elements that may be described in this example (force, inertia, momentum, etc.) and then continue on to the following section.
 3. If they are relatively new to the topics at hand, spend time examining the difference between throwing a stone and using a sling-stone (focus on aerodynamics, momentum, and force as applied through the sling).

Using slingstones in a momentum exercise (15 min.) [optional, for use with an advanced class]

1. Have students calculate the speed with which a stone must be thrown in order to reach a distance of 100 yards. Ask students if this is easy (or possible) by simply using one's arm to throw a stone.
2. Provide students with a specific slingstone example: weight of stone, length of sling, etc.
3. Have students calculate the distance possible at different speeds of release.
4. Using these calculations, compare with the prospect of simply throwing a stone by hand. Discuss with students the technological significance of using a slingstone in comparison to simply throwing a stone.

Recognizing the cultural significance of the slingstone (5 min.)

1. Very briefly, show students a Guam flag or seal (or draw on the board)
2. Ask students if they recognize anything significant in the design.
3. Explain to students that the shape of the design is that of a slingstone, and that such a technological advance was and is widely respected and admired.

Recap (5 min.)

1. Recap what we've done and learned in the lesson

“Today we were presented with a problem: how to throw a stone, with great velocity, long distances. We learned that ancient Chamorros, when presented with this same problem, derived an ingenious tool to overcome this obstacle. This technological leap, the slingstone, proved to be a significant achievement, and is still recognized today in our Guam flag and seal.”

2. Ask students for their favorite parts of the lesson.