



Dancing Wave Movement

Science Performance Assessment

Grade 4

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About This Task

Task Name	Dancing Wave Movement	Grade Level or Course	Grade 4
Phenomenon	How do things wash up onto the shore when they fall into the ocean?	What instruction or experiences should learners have before completing this task?	Students should have experiences modeling observations about waves, wave patterns, the characteristic properties of waves, and how waves can move objects. Tasks should be given after the unit on waves and ocean structures.
Time Required & Materials	Time: ~60 minutes planning, ~60 minutes for presentations Materials: • Copies of the task worksheet for each student. • Paper and writing materials if students want to create visual aids. • Ability to share a video with the class. • Open space for dance practice and performance		
Considerations and Adaptation Suggestion(s)	As students collaborate to make sense of how they are going to plan their dance/expression of wave movement, most of the information about what students know and can do will come out in the small group planning. Be prepared to listen and document student thinking <i>as they are working</i> . Expect their presentations to be messy so avoid penalizing students based on the final product if they've demonstrated understanding during the development phase.		

Standards Emphasis

Assessment is a balancing act involving multiple tradeoffs. No one task can do everything, and often good design carefully considers what *not* to assess. The targeted NGSS Performance Expectation and supporting dimensions are shown below. The parts of the standard not addressed in the task are ~~struck through~~. Each item in the task may target one or more of the dimensions - not every item has to assess every dimension. What matters is that the task as a whole addresses all three dimensions.

NGSS Performance Expectations

- 4-PS4-1:** Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.
- 4-PS3-1:** Use evidence to construct an explanation relating the speed of an object to the energy of that object.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4-1)	PS4.A: Wave Properties Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. <i>(Note: This grade band endpoint was moved from K-2.)</i> Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). PS3.A: Definitions of Energy The faster a given object is moving, the more energy it possesses.	Patterns Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena. Energy and Matter Energy can be transferred in various ways and between objects.

PADI Design Principles Emphasis

The PADI design principles are present in varying ways and to different degrees across these teacher-created science performance tasks. The design principles highlighted for each task represent those that are intentionally emphasized in the task. Educators utilizing these tasks may develop their own interpretations of the application of the design principles, and modifications to the tasks could naturally influence the extent to which each principle manifests.

The PADI Design Principles are:

Student Voice & Agency. Task or activity ensures that the students can make choices within and have agency over some aspects of the learning and assessment experience.

Relationships. Task or activity provides opportunities for students to make connections with others both within and beyond the classroom.

Identity and Inclusion. Task or activity ensures that each student can bring a sense of joy and pride around their identity and individuality to the task. Students should feel safe to be vulnerable and should feel supported by their classroom community (teachers and students).

Groundedness. Task or activity ensures that students can complete the task in their current environment using their current context to apply real-world knowledge to the place where they live. All participants should have awareness of self, others, and surroundings. Task or activity should prioritize presence over productivity. Students should feel like they can answer the question: "Where are my feet planted? What can I do from here?"

This task foregrounds:

- **Student Voice & Agency** by co-adapting a checklist that describes what students need to show in their performance.
- **Relationships** by asking students to work in groups and share their experience with movement as a way to communicate and share ideas.

Teacher Facilitation Guidance

Often performance assessments are new to students. They usually require some degree of transfer from their classroom learning experience and students will need support to share all their ideas in the task.

- 1. Review the Task.** Complete the performance assessment acting as a student in your classroom. Think about the unit you have taught/are teaching. Where might your learners need additional support? What additional activities might you need to do before the Performance Assessment? What adjustments do you need to make to the assessment (e.g., a classroom discussion of the phenomenon) before you send students to complete the task.
- 2. Group Formation.** Prior to beginning the task with students, determine how you will divide students into small groups of 2 or 3.
- 3. Introduce the Task.**
 - a. Watch this video with your class, from 0:00-1:15:
<https://www.youtube.com/watch?v=3FxfXVuHRjM>
 - b. Lead a class discussion: What is the coolest thing you've found washed up on the beach? Or what is a story you have heard about something washed up on the beach?
 - c. Explain to students that they will create a dance and a story to demonstrate their understanding of waves.
- 4. Share an Example.**
 - a. Explain that people share their ideas through dance and here is one example of two people showing how tides work: <https://www.youtube.com/watch?v=Sjrnyl6XOCY>
- 5. Getting Started.**
 - a. Ask students to get in groups and start discussing their ideas. Distribute the [Task Worksheet](#) to each student.
 - b. Together, as a class, review, add to, and revise the checklist of key elements that the dance needs to represent. Encourage students to add elements of their experience with dance, storytelling, and other elements to the checklist (e.g., dance brings joy to our class). The current checklist reads:
 - i. Your dance should explain:
 - How waves are created.
 - How waves in the deep ocean move.
 - How waves near the shore move.
 - How the object moves over time.
 - Properties of at least two different types of waves.
 - The amount of energy in the different waves.
 - c. Give students about 40 minutes to storyboard and plan their dances in their groups. Work with and check in on students as they work on their storyboards in order to:
 - i. Ensure the story includes how waves move up and down in place and how they move objects to the shore.
 - ii. Encourage creativity while ensuring scientific accuracy.
- 6. Time to Practice.** Ensure each group rehearses their performance, coordinating movements with the narrative.
- 7. Class Performance:** Organize a class performance where each group teaches their dance to the other students and the class performs each dance. Use the feedback guidance for giving feedback and prompting for additional understanding. Celebrate students' efforts and understandings during the final performance.

Student Task Worksheet

A student version of the task worksheet is linked [here](#).

Feedback and Scoring Guidance

In each group's storyboard, teaching, and performance, look for the following:

LOOK FORS	GUIDING QUESTIONS
Initial disruption: Dance/storyboard shows wave is initiated by a disturbance.	<i>How did your wave get started? Can you show how this happens?</i>
Wave Movement: Dance/storyboard shows waves moving up and down in place.	<i>What did we learn about the direction waves move? When do waves change their direction?</i>
Object Movement: Dance/storyboard shows the movement of the object over time.	<i>How does the motion of the object change over time? What happens to the object when you change the properties (wavelength/amplitude) of the wave?</i>
Amplitude: Movements represent different wave heights.	<i>Are waves always the same height? How might you show that? What does changing the height of a wave tell us about the wave?</i>
Wavelength: Movements represent different distances between wave peaks.	<i>Are waves always the same shape? How can you change the shape of a wave? When you change the shape of a wave, what property does that represent?</i>
Energy: Movements/story represent the amount of energy in two different types of waves.	<i>Compare your dance to another group's? Is one object moving faster than another? What does that tell us about the amount of energy in the waves? How does the amplitude/frequency of your wave relate to the energy of your wave? How can you show that in your dance? What happens if the amplitude/wavelength changes?</i>
Story: A scientifically accurate story, dance, and/or storyboard explaining how an object floats in the ocean and reaches the shore using the movements as an abstract representation of wave properties.	<i>Tell me more about how this movement represents _____ (wave property). In your dance, this happened and then this happened, how does that help to explain your object moving to shore?</i>
Group Participation: All group members contribute to the creation and performance.	<i>Share with a partner about your contribution to the group. Tell me a story about how you supported your group members. What would you do the same or different next time?</i>