

## MORE THAN JUST LIFE JACKETS

### 6th-8th Grade Discussion Guide

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#### SCIENCE CATEGORIES

Life Science and Physical Science

#### TIMEFRAME

Two to Three Class Periods

#### MATERIALS

Soup or vegetable cans (must be identical for each team), paper cups, straws, paper towels, rubber bands, paper clips, tape, balloons, plastic bags or lunch bags, glue, corks, foam pieces, string, foil, hose or tubes, small containers, paper towels, other items available in the classroom. Access to a large sink or a large plastic tub filled with water.

#### KEYWORDS

Buoyancy, PFDs, Mass, Density, Positive Buoyancy, Neutral Buoyancy, Negative Buoyancy



## LEARNING OBJECTIVES

- Understand how life jackets are designed to save lives.
- Determine which PFD is appropriate to use in a variety of situations.
- Design a PFD and analyze its effectiveness

## ACTIVITY SUMMARY

This lesson will explore the design and use of personal flotation devices. Students will understand that there are a variety of PFDs and they are used in different situations. They will also understand how life jackets are designed to save lives.

Students will first consider which PFD is most appropriate to use in a variety of scenarios. Next, they will work with a partner to compare and contrast two PFDs.

Finally, students will work in groups of three to construct their own PFDs. Students will work to design, build and evaluate the effectiveness of their prototype. If the first attempt is not successful, students will have the opportunity to redesign and modify their prototype. As a culminating activity, students will collaboratively write a report on their learning and the results.

## BACKGROUND INFORMATION

UL is an organization that works with the coastguard to approve the use of personal flotation devices, or PFDs.

UL uses two methods to test life jackets; mechanical labs and pools. Some examples of mechanical testing include attaching a weight to the jacket to ensure the buckles and straps stay intact. If the life vest is made of foam, the foam is removed and placed under water for twenty-four hours to ensure it maintains buoyancy. They will even put a life jacket through a flame.

The key to a life jacket saving a life is buoyancy. For an object, like a PFD, to float, it must be less dense than the water.

Nowaday most PFDs are made of foam, a substance with positive buoyancy. In the past they were made of materials such as cork, wood or even animal skins inflated with air like a balloon.

There are many different types of PFDs designed to work for different water activities.

- Type 1 PFD: Bulky, designed for rough, open waters. They will turn the user face up in case they are unconscious. They also hold the user out of the water to keep a swimmer warmer for longer.
- Type 2: Calm, inland waters where rescuers are closer at hand. Less bulky than Type 1. Still turn the user face up in case of unconsciousness.
- Type 3: For use with recreational boats where rescue is ensured to be close at hand. Also known as buoyancy aids. For use by confident swimmers. Still considered a life jacket.
- Type 4: Throwable's such as a boat cushion. Not considered a life jacket because it can't keep a person's face out of the water. Great for additional buoyancy when paired with a wearable PFD.
- Type 5: Intended for use by someone who has had training. Designed for a specific use and only intended for that purpose.

## VOCABULARY

**BUOYANCY:** the ability or tendency to float in water or air or some other fluid.

**PFDs:** personal flotation device, a life jacket or similar buoyancy aid.

**MASS:** a quantity that measures of the quantity of matter in a particular object, particle, or space

**DENSITY:** measures the mass of an object or substance compared to its volume

**POSITIVE BUOYANCY:** an object is lighter than water and floats.

**NEUTRAL BUOYANCY:** an object has an equal tendency to float and sink

**NEGATIVE BUOYANCY:** an object is heavier than water and sinks



## Example:

Maybe you've seen a life jacket before, but what do you know about them? What makes a life jacket capable of saving a life, and how can you pick the right one for you?

Based on your knowledge from the video, I will provide several scenarios. On a note card, write down which type of PFD you think would be the most appropriate to use in this scenario.

Scenario 1: You are working as a lifeguard and you need to perform a water rescue (Type 5)

Scenario 2: You are spending the day water tubing at the lake. (Type 3)

Scenario 3: You are working on a fishing boat in the ocean. (Type 1)

## ACTIVITY 1:

Compare and contrast the different types of PFDs.

The instructor should write TYPE 1, TYPE 2, TYPE 3, TYPE 4 and TYPE 5 repeatedly (in reference to types of PFDs) on slips of paper so there are enough slips for each student in the class. Place the folded slips of paper into a bucket. Instruct partners to choose two slips of paper from the bucket. Their task will be to write a paragraph comparing/contrasting the two types of PFDs.

You may want to provide students with some sentence stems to structure their writing.



## ACTIVITY 2:

Inform students that based on their newfound knowledge of PFDs teams of three will design, build and test their own PFD.

This activity requires a number of supplies (listed in materials list above) so the instructor will want to consider how supplies will be acquired.

Explain to students that they will have access to a variety of supplies they can use to construct a PFD that will provide positive buoyancy for a can of food (note that all cans of food should be the same for consistency between teams).

Prior to accessing materials to build their PFD each team must present a design which includes a visual, material list and a minimum of a one paragraph explanation of the design and material choice.

Teams may then begin building their PFDs. When PFDs are complete, teams will test their effectiveness using a large tub or sink full of water. To be considered effective the PFD must demonstrate positive buoyancy for at least twenty seconds.

If the PFD doesn't demonstrate positive buoyancy, instruct teams to return to their design to make adjustments including a paragraph explanation of the adjustments. Teams may then modify or rebuild their PFD.

At the culmination of the activity students will write a report including the design process, what worked well and what could be improved and the final results of their trials. Students may divide the written sections, but the final report should include clear transitions between sections.

The instructor may want to provide some guidance for each written section. Some suggestions are offered below:

### Design Process

- What were your thoughts behind your design?
- What materials did you choose and why did you choose them?
- What was the procedural process for building your PFD (step-by-step of the build)?

### Worked Well and Could be Improved

- In your first design what worked well and why?
- In your first design what needed to be improved and why?
- If you had to make adjustments, what were they? Did they improve the design? How?

### Final Results

- What were the final results of your PFD (include both rounds if you had to modify or rebuild)?
- If you had to do this project again, what would you change?



## CONCLUSION

Now that you know how PFDs work and how to pick the right one for you, share your knowledge and encourage your friends and family to wear their PFDs when out on the water. On a notecard or in your writing journal write three things you've learned about PFDs that you will share with your friends and family.

## EXTENDING THE LESSON

- Research Type 5 PFDs. Each student chooses a different type of Type 5 and presents their findings to the class
- Create a timeline of the history of PFDs.
- Interview a lake police (harbor patrol), lifeguards or coast guard about what PFD they use and why it is key to their career.
- Invite a guest speaker who uses or works with PFDs to speak to the class. Students can draft questions prior to the event.
- Research local and state laws regarding PFDs.
- Create an informative video explaining the importance of PFDs and how to choose the correct PFD.

## RELATED LINKS

- Selecting a PFD - UL <https://www.ul.com/news/its-match-selecting-life-jacket-fits>
- The different tests - UL <https://www.ul.com/news/world-life-jacket-testing>
- Statistics on how PFDs save lives <https://www.ul.com/news/statistics-show-personal-flotation-devices-help-save-lives>
- Signing up for PFD testing at UL <https://www.ul.com/services/personal-flotation-device-certifications>



Educational Partner:



Produced under a grant from the Sport Fish Restoration and Boating Trust Fund, administered by the U.S. Coast Guard.

The following National Common Core Standards can be met teaching;

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### 4TH GRADE

**CCSS.ELA-LITERACY.W.4.2**

Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

**CCSS.ELA-LITERACY.W.4.4**

Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

**CCSS.ELA-LITERACY.SL.4.1**

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.

**CCSS.ELA-LITERACY.SL.4.4**

Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pacedescriptive details, and well-structured event sequences.

### 5TH GRADE

**CCSS.ELA-LITERACY.W.5.2**

Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

**CCSS.ELA-LITERACY.W.5.4**

Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

**CCSS.ELA-LITERACY.SL.5.1**

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

**CCSS.ELA-LITERACY.SL.5.4**

Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

### 6TH GRADE

**CCSS.ELA-LITERACY.W.6.2**

Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

**CCSS.ELA-LITERACY.W.6.4**

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

**CCSS.ELA-LITERACY.SL.5.1**

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

**CCSS.ELA-LITERACY.SL.5.1**

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

**CCSS.ELA-LITERACY.SL.5.4**

Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.



## 7TH GRADE

**CCSS.ELA-LITERACY.W.7.2**

Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

**CCSS.ELA-LITERACY.W.7.4**

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

**CCSS.ELA-LITERACY.SL.7.1**

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

**CCSS.ELA-LITERACY.SL.7.4**

Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

## 8TH GRADE

**CCSS.ELA-LITERACY.W.8.2**

Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

**CCSS.ELA-LITERACY.W.8.4**

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

**CCSS.ELA-LITERACY.SL.8.1**

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

**CCSS.ELA-LITERACY.SL.8.4**

Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

## 9-10 GRADE

**CCSS.ELA-LITERACY.W.9-10.2**

Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

**CCSS.ELA-LITERACY.W.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.SL.9-10.1**

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

**CCSS.ELA-LITERACY.SL.9-10.4**

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.



Educational Partner:



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## 11-12 GRADE

- CCSS.ELA-LITERACY.W.11-12.2** Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- CCSS.ELA-LITERACY.W.11-12.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CCSS.ELA-LITERACY.SL.11-12.1** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
- CCSS.ELA-LITERACY.SL.11-12.4** Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.