Transforming a Car into a Boat Teacher Lesson Plan

Investigation at a Glance

Overview

Type	Investigation
Minutes	240
Days	8 (30 minutes per day)

Description of the Investigation

Students are shown a video of an artist using scrap metal and turning it into art. They then need to figure out how to turn a toy car into a boat using the same materials. Students will use a toy car and build a boat that floats.

Guiding Question

How can we make a toy car and boat with the same materials?

What Students Figure Out

Assembling parts into a whole is achievable through recombination. They also recognize the significance of the physical properties of materials in determining the outcome of their creations.

Stages of Activities

Task (Day 1)
- Introduction of a phenomenon or problem for students to figure out.
- 30 minutes

Ideas (Day 2)
- Students learn about how whole parts can be recombined to form a new material based on physical properties.
- 30 minutes

Plan (Day 3)
- Students plan an investigation as a class.
- 30 minutes

Do (Day 4)
- Students carry out the investigation in small groups.
- 30 minutes

Share (Day 5)
- Small groups share what they figured out and then help create a class argument.
- 30 minutes

Reflect (Day 6)
- The teacher reads *Boxitects* and encourages students to reflect on what they learned about transforming a car into a boat.
- 30 minutes

Report (Day 7)
- Students write reports to share what they figured out with a parent or caregiver.
- 30 minutes

Report (Day 8)
- Students receive feedback from the teacher and then revise their reports based on the feedback.
- 30 minutes

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Investigation Standards Alignment

STANDARDS ALIGNMENT

NEXT GENERATION SCIENCE STANDARDS

Performance Expectation

2PS1-3: Demonstrate that small units such as building blocks can be combined or reassembled to form new objects for different purposes and explain material choices based on physical properties.

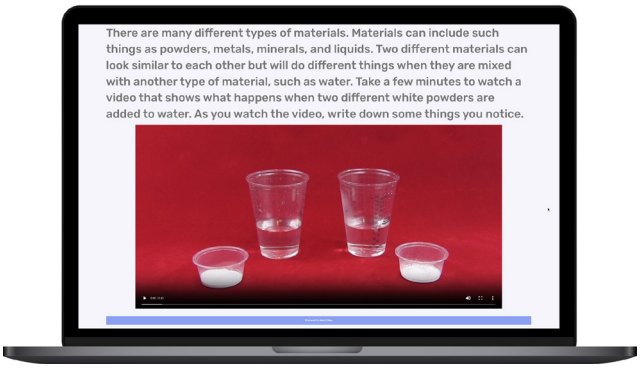
Core Ideas(s)	Crosscutting Concept(s)	Practices
PS1.A: Structure and Properties of Matter	Systems and System Models (CC4)	Asking Questions (SEP1) Developing and Using Models (SEP2) Planning and Carrying Out Investigations (SEP3) Analyzing and Interpreting Data (SEP4) Using Mathematics and CT (SEP5) Constructing Explanations (SEP6) Engaging in Argument from Evidence (SEP7) Obtaining, Evaluating, and Communicating Information (SEP8)

WIDA ENGLISH LANGUAGE DEVELOPMENT STANDARDS FOR SCIENCE

Explain	Argue
Use visual and context to support understanding. Describe observations using grade-level vocabulary.	Participate in discussions and provide evidence-based arguments. Support opinions with relevant evidence from scientific observations.

ADI Go Digital

The digital version of this lesson is available in the **ADI Learning Hub**. Be sure to check out the built-in teacher presentation mode.



COMMON CORE ENGLISH LANGUAGE ARTS

Reading	Writing	Speaking and Listening
CCSS.ELA-LITERACY.RI.2.1: Ask and answer questions about key details in a text related to material properties and uses.	CCSS.ELA-LITERACY.W.2.2: Write informative/explanatory texts about how different materials can be used for various purposes.	CCSS.ELA-LITERACY.SL.2.1: Participate in collaborative conversations about materials and their functions.

COMMON CORE MATH

Number and Operations in Base Ten (NBT)	Operations and Algebraic Thinking (OA)	Measurement and Data (MD)
CCSS.MATH.CONTENT.2.NBT.B.5: Use addition and subtraction within 100 to solve problems related to classifying and quantifying material properties.	CCSS.MATH.CONTENT.2.OA.C.4: Use addition to find totals when counting and classifying objects based on their properties.	CCSS.MATH.CONTENT.2.MD.D.10: Create picture and bar graphs to represent data about material properties and uses.

Teacher Notes

Transforming a Car into a Boat Teacher Lesson Plan

Vocabulary

Academic Vocabulary Development

"Learned Words"

At the end of the lesson, students should understand the meaning of the following terms and how they are used in the context of science:

1. **Combine:** To put things together
2. **Reassemble:** To put things together after taking them apart
3. **Materials:** The things used to make something
4. **Texture:** How something feels, like being bumpy or smooth
5. **Create:** Using your imagination to make new things
6. **Solve:** To find an answer or fix a problem
7. **Build:** To create or make something

Note: There is no need to pre-teach these terms to students before the lesson begins. Students are introduced to them during Stage 2 of the lesson, and they revisit them during stages 5, 6, and 7. Students should be encouraged to add these terms to the section of their handout called "Learned Words" (Stage 7) so they can use them to share what they have learned as they write their reports.

Teaching Tip

Have a science vocabulary anchor chart titled "Learned Words". and add new vocabulary words to the anchor chart as they come up during the lesson.

Find more Teaching Tips in the Learning Hub

Teacher Notes

Transforming a Car into a Boat Teacher Lesson Plan

Things to Know Before Starting the Lesson

Things to Know Before Starting the Investigation

The Science Behind the Phenomenon

Basic Concepts of Matter:

- Everything is made of matter.
- Matter can exist in various forms, such as solids, liquids, and gases.

Properties of Materials:

- Physical properties of materials, including texture, flexibility, hardness, and color.
- Different materials have different properties.

Building Blocks and Construction:

- Building blocks or units can be assembled to create larger structures or objects.
- Reassembly means that objects can be taken apart and put back together.

Common Student Misconceptions About the Science

- **Materials are static:** Students might think that materials are unchangeable and have a fixed purpose. They may not realize that materials can be transformed or repurposed to serve different functions.
- **Size equals strength:** Some students may believe that larger building blocks or objects are always stronger and better for construction, disregarding the role of materials' physical properties in determining their suitability for a task.
- **All materials are the same:** Students might assume that all materials are interchangeable, not recognizing that different materials have unique properties, such as flexibility, hardness, or weight, that make them better suited for specific uses.
- **Physical properties are unimportant:** Students may underestimate the importance of understanding a material's physical properties in construction. They might believe that the choice of materials is arbitrary and unrelated to the function of an object.
- **Materials have a single purpose:** Some students may think that materials can only be used for one specific purpose, not realizing the versatility of materials when combined creatively.

Transforming a Car into a Boat Teacher Lesson Plan

Preparation

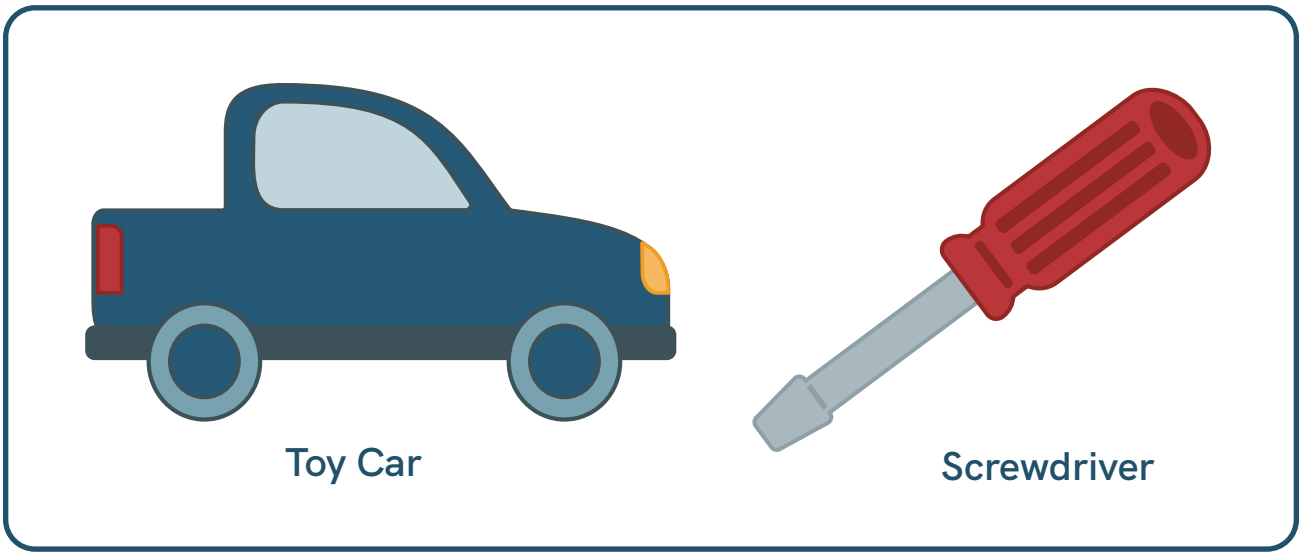
Materials Needed

The materials needed for the in-person version of this investigation are listed in the table below. To purchase the **Transforming a Car into a Boat** kit from the ADI store, visit https://shop.argumentdriveninquiry.com/. The **Transforming a Car into a Boat** kit comes with enough materials for six groups as well as the picture book.

Type of Material	Item	Quantity
Consumables	Toy car with multiple pieces	1 per group
Equipment	Screwdriver	1 per group
	Container of water or a sink filled with water to test if the boat floats	1 per class
Safety	Goggles	1 per student
	Apron or lab coat	1 per student
Book	*Boxitects* by Kim Smith	1 per class

Setup

Students will be given a toy car and a screwdriver. They can disassemble the car and rebuild it into whatever design they want that becomes a boat.



We recommend that you use a set routine for distributing and collecting the materials during the investigation. The consumables and equipment for each group, for example, can be set up at each group's lab station before class begins, or one member from each group can collect them from a table or a cart when needed during class.

Safety Recommendations

Review the class safety rules before students begin working with materials during this investigation. It is important to point to the ADI Safety Poster for a review of the general rules concerning classroom safety. Additional safety considerations for this investigation include:

- Students should wear safety goggles and lab coats/aprons at all times when potentially sharp objects are present in the work area.
- Students should wear safety goggles and lab coats/aprons at all times when liquids are present in the work area.

Make sure to go over these lesson-specific safety rules after you review the general safety rules on the ADI Safety Poster. We also recommend posting these rules on your classroom chalkboard/whiteboard or projecting them onto the screen so students can refer to them while conducting this investigation.

Cleanup

Part of maintaining a safe and productive lab environment is the proper cleanup of materials and disposal of consumables. The teacher implementation guide provides general instructions for establishing a general set of cleanup procedures.

These cleanup procedures should be detailed for students before they begin working with the materials. We also recommend posting these procedures on your classroom chalkboard/whiteboard or projecting them onto the screen so students can refer to them while conducting this investigation.

Teacher Notes

Transforming a Car into a Boat Teacher Lesson Plan

Stage 1 TASK

Logistics

Time Needed	Physical Space	Group Size
30 minutes	Classroom	Individual Small groups (3-4 students)

Materials Needed

ADI Learning Hub	Student Handouts	Other Materials
Stage 1: Task	Stage 1: Task	Chart paper Marker pens

Learning Goals

Students should make progress on their ability to do the following by the end of this stage of the lesson:

SCIENCE

1. Explore and describe how different materials have specific properties that influence their structure and function within a system (PS1.A).
2. Examine parts of a whole to define or model a system and understand the relationship between structure and function (CC1).
3. Ask questions about how different materials can be used to build or modify objects (SEP1).
4. Communicate their conclusions about material properties through various formats, including pictures and verbal explanations (SEP8).

WIDA ENGLISH LANGUAGE DEVELOPMENT STANDARDS FOR SCIENCE

1. Use visual and context clues to describe the structure and function of materials and explain how small parts can form larger objects (Explain).

COMMON CORE ENGLISH LANGUAGE ARTS

1. Engage in collaborative discussions, sharing their thoughts on how materials can be assembled and listening to others' ideas (CCSS.ELA-LITERACY.SL.2.1).

Stage 1: Activity 1 – The Phenomenon

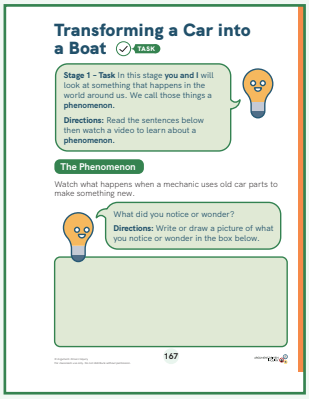
A

- Ask, "Have you ever built something out of blocks or other small parts?" Allow students to share.
- Say, "We are now going to watch a video about a mechanic that uses old car parts to create art."
- Show the video in the Learning Hub on a screen.

Stage 1: Activity 2 – Share What You Noticed

A

- Say, "What did you notice about breaking things apart and putting them back together as you watched that video? Take a few minutes to draw a picture of what you noticed on your handout."
- Allow the students to draw a picture on their handouts.


Transforming a Car into a Boat TASK

Stage 1 – Task In this stage you and I will look at something that happens in the world around us. We call those things a phenomenon.

Directions: Read the sentences below then watch a video to learn about a phenomenon.

The Phenomenon

Watch what happens when a mechanic uses old car parts to make something new.

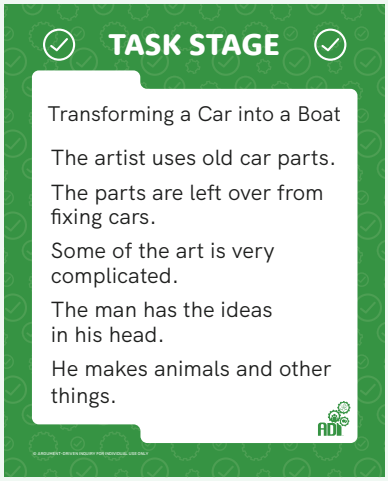
What did you notice or wonder?

Directions: Write or draw a picture of what you notice or wonder in the box below.

167

B

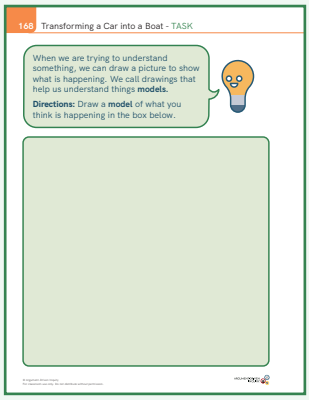
- Say, "Please share your picture of what you noticed with the others in your group."
- Allow students to share what they noticed.
- After students have discussed in groups, have each group share.
- Say, "Let's record the things we noticed on the anchor chart."
- Record the things they noticed on a Task Stage anchor chart.



Stage 1: Activity 3 - Create a Model

A

- Say, "Scientists use something called a **model** to help them understand and explain things. These models are like pictures that show how something works or looks. Just like when you draw a picture to show your ideas, scientists use models to show their ideas about how things work in the world. I want you to draw a picture on your handout that shows how you think a car could turn into a boat."
- Have students draw a model on their own to explain how they think a car could turn into a boat.



B

- Say, "Please share your picture of how you think a car could turn into a boat with the others in your group."
- Allow students to share their pictures (models) with one another.
- After students have discussed in groups, have each group share.
- Be sure to draw attention to students' ideas that are related to reusing the car parts to make the boat.

Teaching Tip

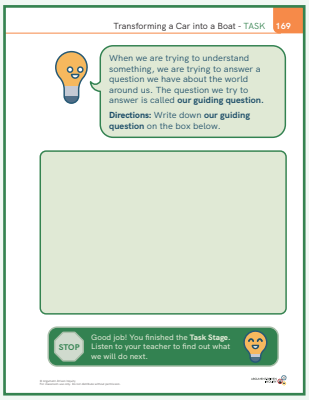
To encourage more talk between students, use the **Think-Pair-Share** strategy. This strategy requires students to (1) think individually about a topic or answer to a question; and (2) share ideas with classmates.

Find more Teaching Tips in the Learning Hub

Stage 1: Activity 4 – What You Need to Figure Out

A

- Say, "It sounds like we have many ideas about how you think a car could turn into a boat. So, I think we need to figure out an answer to this guiding question: **How can we make a toy car and boat with the same materials?**"
- Write down "**How can we make a toy car and boat with the same materials?**" on the whiteboard or a piece of chart paper.
- Say, "Please write this question down on your handouts so we don't forget it."
- Have students write down the guiding question on their handouts.


Transforming a Car into a Boat - TASK 169

When we are trying to understand something, we are trying to answer a question we have about the world around us. The question we try to answer is called **our guiding question**.

Directions: Write down **our guiding question** on the box below.

STOP Good job! You finished the **Task Stage**. Listen to your teacher to find out what we will do next.

Attending to Equity

- Group students who need extra help with those who are helpful and can provide peer support. These groups can work together during the investigation.
- Be sure to provide emerging multilingual students with opportunities to talk in small groups before asking them to share with the entire class during this activity. Small-group structures offer all students, including emerging multilingual students, a chance to engage in sense-making with their peers as well as space to use their verbal and nonverbal (e.g., writing, drawing pictures, and using gestures) resources to express their ideas. Small-group structures also give students a chance to learn from other students' uses of these resources. When students are tasked with expressing their ideas, be sure to encourage them to do so through multiple modes (speaking, writing, drawings, and gestures). In addition, encourage students to use both content-specific and everyday registers. This process helps students fully express themselves, allowing peers to evaluate, question, and build on ideas.

Teacher Notes

Transforming a Car into a Boat Teacher Lesson Plan

Stage 2 IDEAS

Logistics

Time Needed	Physical Space	Group Size
30 minutes	Classroom	Small groups (3-4 students)

Materials Needed

ADI Learning Hub	Student Handouts	Other Materials
Stage 2: Ideas	Stage 2: Ideas	Chart paper Marker pens

Learning Goals

Students should make progress on their ability to do the following by the end of this stage of the lesson:

SCIENCE

1. Explore and describe how different materials have specific properties that influence their structure and function within a system (PS1.A).
2. Examine parts of a whole to define or model a system and understand the relationship between structure and function (CC1).
3. Ask questions about how different materials can be used to build or modify objects (SEP1).
4. Communicate their conclusions about material properties through various formats, including pictures and verbal explanations (SEP8).

WIDA ENGLISH LANGUAGE DEVELOPMENT STANDARDS FOR SCIENCE

1. Use visual and context clues to describe the structure and function of materials and explain how small parts can form larger objects (Explain).

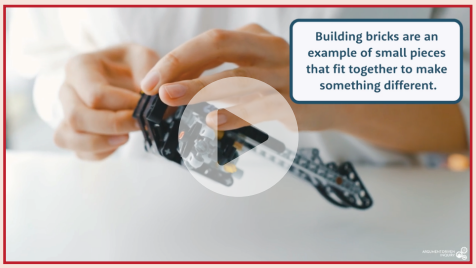
COMMON CORE ENGLISH LANGUAGE ARTS

1. Engage in collaborative discussions, sharing their thoughts on how materials can be assembled and listening to others' ideas (CCSS.ELA-LITERACY.SL.2.1).

Stage 2: Activity 1 – Some Helpful Science Ideas

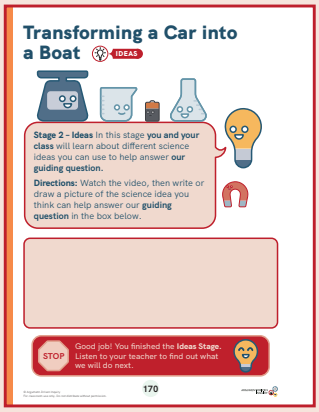
A

- Say, "I am going to show you a video that will help us answer our guiding question. Let's watch the video."
- Play the video.



B

- Say, "Please write or draw a picture of some science ideas that you think will help us answer our guiding question."
- Give students a few minutes to write or draw their ideas on their handouts.



C

- Ask, "What ideas do you think will help us answer our guiding question?"
- On an Ideas Stage anchor chart, list some of the things that students mention. Make sure the following ideas are added to the chart:
  1. Small things can fit together.
  2. Things can do more than one job.
  3. The materials need to be the right ones when you build something.

Teaching Tip:

You have a few options for sharing the video presentation with the class:

- Display it to the class using the Presentation mode in the Learning Hub.
- Have students watch it in small groups using one device.
- In a 1:1 classroom, students can watch the video individually.

To help students identify ideas:

- You may want to show the video twice. The first time you can show it all the way through. Then on the second viewing, stop it after each "big idea" and give students time to write and draw before showing the next "big idea".
- Replay the video again if you are afraid they missed one of the big ideas when filling out the anchor chart and tell the students to "look for anything that we have not added to our list of helpful science ideas" as they watch.

To help promote and support student talk be sure to:

- Encourage all students to actively participate in group discussions.
- Give clear instructions for turn-taking and active listening.

Find more Teaching Tips in the Learning Hub

Attending to Equity

- There are many supports for helping students comprehend what they read (i.e., activating prior knowledge, providing a shared experience, making connections, synthesizing, and talking with peers) already embedded into this stage.
- Be sure to encourage your emerging multilingual students to:
  1. Use strategic learning techniques, such as concept mapping, drawing, memorizing, comparing, contrasting, and reviewing.
  2. Decode (sound out) words using skills, such as recognizing sound-letter relationships and identifying cognates, affixes, roots, and base words.
  3. Use visual and contextual support and support from peers and teachers to enhance and confirm understanding of the texts.
- Be sure to intentionally group emerging multilingual students at times with peers who know the same languages as they do and at other times with peers whose English language development is slightly more advanced. Thoughtful grouping that varies throughout an investigation allows emerging multilingual students to benefit from the different linguistic resources of their peers.

Transforming a Car into a Boat Teacher Lesson Plan

Stage 3 PLAN

Logistics

Time Needed	Physical Space	Group Size
30 minutes	Classroom	Small groups (3-4 students)

Materials Needed

ADI Learning Hub	Student Handouts	Other Materials
Stage 3: Plan	Stage 3: Plan	Chart paper Marker pens Toy car with multiple pieces Screwdriver Container of water or a sink filled with water

Learning Goals

Students should make progress on their ability to do the following by the end of this stage of the lesson:

SCIENCE

1. Explore and describe how different materials have specific properties that influence their structure and function within a system (PS1.A).
2. Examine parts of a whole to define or model a system and understand the relationship between structure and function (CC1).
3. Ask questions about how different materials can be used to build or modify objects (SEP1).
4. Plan and carry out investigations to observe and test how materials can be reassembled for different purposes (SEP3).
5. Use mathematical skills to classify, record, and organize data about material properties and structures (SEP5).
6. Communicate their conclusions about material properties through various formats, including pictures and verbal explanations (SEP8).

WIDA ENGLISH LANGUAGE DEVELOPMENT STANDARDS FOR SCIENCE

1. Use visual and context clues to describe the structure and function of materials and explain how small parts can form larger objects (Explain).

COMMON CORE ENGLISH LANGUAGE ARTS

1. Engage in collaborative discussions, sharing their thoughts on how materials can be assembled and listening to others' ideas (CCSS.ELA-LITERACY.SL.2.1).

Stage 3: Activity 1 – Some Materials You Can Use

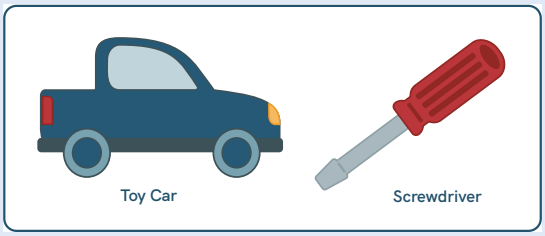
A

- Before beginning this activity, gather the materials listed in the table at right.
- Place the materials on a table so students can see them.

Type of Material	Item	Quantity
Consumables	Toy car with multiple pieces	1 per group
Equipment	Screwdriver	1 per group
	Container of water or a sink filled with water to test if the boat floats	1 per class
Safety	Goggles	1 per student
	Apron or lab coat	1 per student
Book	*Boxitects* by Kim Smith	1 per class

B

- Say, "Okay, it sounds like we now have enough information to plan an investigation that will help us figure out how to make a toy car and boat with the same materials."
- Say, "Before we get started, I want to show you some materials that we are going to be able to use during our investigation. Will you all please come over to this table so I can show you what we have?"
- Direct students to stand around the table where all the materials are set up.



Teaching Tip

This activity helps students see for themselves all the materials they will be able to use during the hands-on part of the investigation instead of just reading about them or looking at pictures. It is important to show each material to the students and then point out how they can use it during the investigation so they can participate in developing a plan during the next activity.

Find more Teaching Tips in the Learning Hub

C

- Hold up the toy car.
- Ask, "What do you think we could use this for?"
- Allow students to share ideas. Then say, "We can use this for the parts to create a boat."
- Hold up the screwdriver.
- Ask, "What do you think we could use this for?"
- Allow students to share ideas. Then say, "We can use this to help take the toy car apart."
- Hold up the bowl of water.
- Ask, "What do you think we could use this for?"
- Allow students to share ideas. Then say, "We can use this to test if the boat works."
- Say, "Okay, that is all the stuff we can use. Will you all head back to your groups so we can plan our investigation?"

Teaching Tip

When students are tasked with expressing their ideas, be sure to encourage them to do so through multiple modes (speaking, writing, drawings, and gestures) and to use both content-specific and everyday registers. This process helps students fully express themselves, allowing peers to evaluate, question, and build on ideas.

Find more Teaching Tips in the Learning Hub

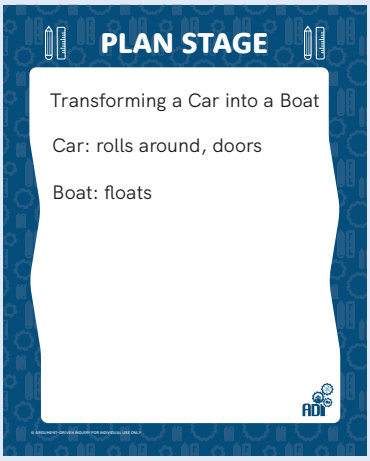
ADI Go Digital

Visit the Learning Hub to download Anchor Charts for your classroom. You can find them by going to the Investigation Dashboard and clicking on Investigation Downloads.

Stage 3: Activity 2 – Make a Plan

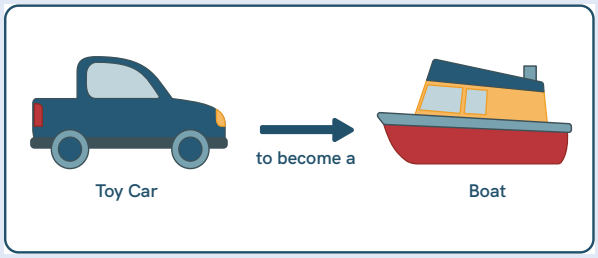
A

- Place a Plan Stage anchor chart on the wall (see image here).
- Say, "Okay, we are now going to come up with our plan. I think the first thing we should do is think about the differences in a car versus a boat."



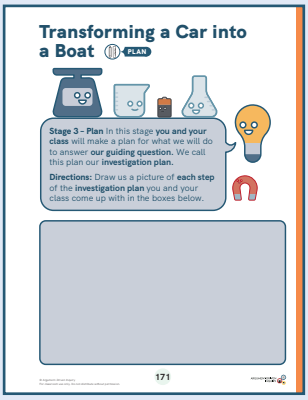
B

- Draw a picture of the model of a toy car versus a boat on the anchor chart (see image to the right).



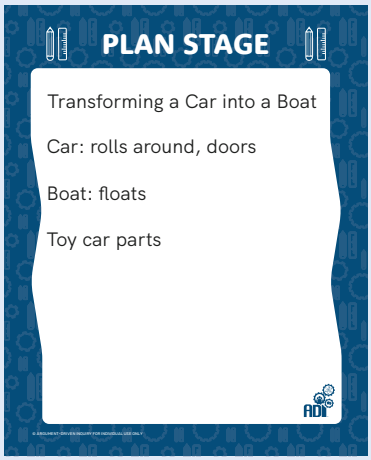
C

- Say, "Okay, will you all draw a picture of our toy car and all its parts in the first box on your handouts? Be sure to put a 1 in the corner of the box so we don't forget think to do this first."
- Give the students a few minutes to draw a picture of the model on their handouts.



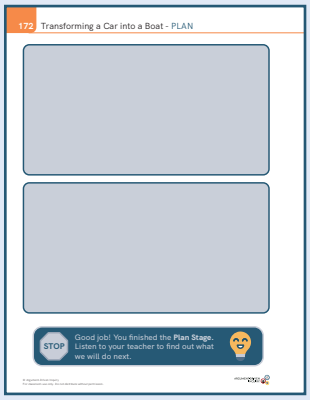
D

- Say, "Okay, what should we do next?"
- Allow students to share their ideas.
- Say, "All those ideas are great. Why don't we see what happens when we take our toy car apart? We can then record what pieces we have that might work for our boat."
- Write this step of the plan and draw a picture showing it on the anchor chart.



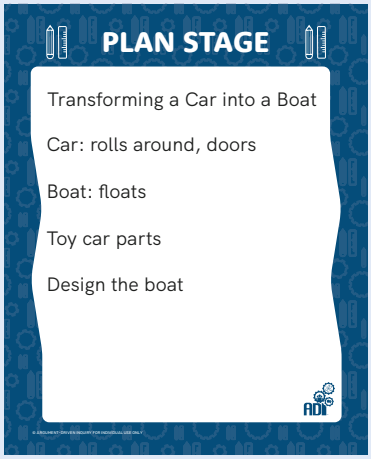
E

- Say, "Draw a picture of this step of our plan in the second box on your handout. Be sure to put a 2 in the corner of the box so we don't forget to do this step second."
- Give the students a few minutes to draw a picture of this step on their handouts.



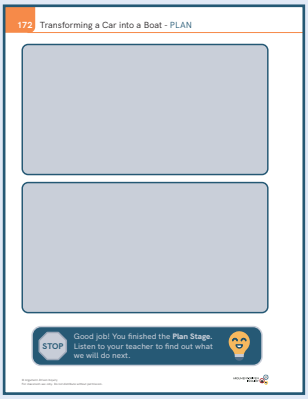
F

- Say, "Okay, what should we do next?"
- Allow students to share their ideas.
- Say, "All those ideas are great. Why don't we see what happens when we start figuring out the parts for the boat? Then, we can start to design the boat."
- Write this step of the plan and draw a picture showing it on the anchor chart.



G

- Say, "Draw a picture of this step of our plan in the third box on your handout. Be sure to put a 3 in the corner of the box so we don't forget to do this step third."
- Give the students a few minutes to draw a picture of this step on their handouts.



Teaching Tip

To support emerging multilingual students during this stage, be sure to create a word bank on the wall of high-frequency, high-need, concrete vocabulary that is needed to communicate science ideas. The word bank highlights terms needed for basic communication in an academic context. It also helps with the spelling.

Find more Teaching Tips in the Learning Hub

Teacher Notes

Transforming a Car into a Boat Teacher Lesson Plan

Stage 4 DO

Logistics

Time Needed	Physical Space	Group Size
30 minutes	Classroom or outside	Small groups (3-4 students)

Materials Needed

ADI Learning Hub	Student Handouts	Other Materials
Stage 4: Do	Stage 4: Do	Toy car with multiple pieces Screwdriver Container of water or a sink filled with water Goggles Apron

Learning Goals

Students should make progress on their ability to do the following by the end of this stage of the lesson:

SCIENCE

1. Explore and describe how different materials have specific properties that influence their structure and function within a system (PS1.A).
2. Examine parts of a whole to define or model a system and understand the relationship between structure and function (CC1).
3. Ask questions about how different materials can be used to build or modify objects (SEP1).
4. Develop models (e.g., diagrams or physical models) to show how materials can be combined to form new objects (SEP2).
5. Plan and carry out investigations to observe and test how materials can be reassembled for different purposes (SEP3).
6. Collect and analyze data to identify patterns and relationships between material properties and their functions (SEP4).
7. Use mathematical skills to classify, record, and organize data about material properties and structures (SEP5).
8. Construct explanations and propose solutions for how material properties affect their use in different designs (SEP6).
9. Engage in discussions to share their findings, using evidence to explain the choices of materials based on their properties (SEP7).
10. Communicate their conclusions about material properties through various formats, including pictures and verbal explanations (SEP8).

WIDA ENGLISH LANGUAGE DEVELOPMENT STANDARDS FOR SCIENCE

1. Use visual and context clues to describe observations of different materials using appropriate vocabulary (Explain).

COMMON CORE ENGLISH LANGUAGE ARTS

1. Ask and answer questions about key details in texts related to how materials are used and combined for different purposes (CCSS.ELA-LITERACY.RI.2.1).
2. Engage in collaborative discussions, sharing their thoughts on how materials can be assembled and listening to others' ideas (CCSS.ELA-LITERACY.SL.2.1).

COMMON CORE MATH

1. Fluently add and subtract within 100 as they quantify and compare material properties (CCSS.MATH.CONTENT.2.NBT.B.5).
2. Use addition to categorize materials and form groups based on their properties (CCSS.MATH.CONTENT.2.OA.C.4).
3. Create picture and bar graphs to represent data about material properties, such as size, weight, or flexibility (CCSS.MATH.CONTENT.2.MD.D.10).

Stage 4: Activity 1 – Carry Out Your Plan

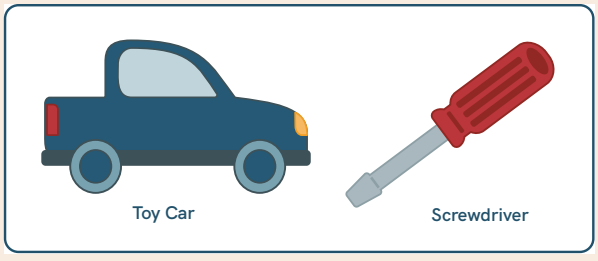
A

- Before beginning this activity, gather the materials listed in the table to the right.
- Place the materials on a table so students can use them as they carry out their investigations.

Type of Material	Item	Quantity
Consumables	Toy car with multiple pieces	1 per group
Equipment	Screwdriver	1 per group
	Container of water or a sink filled with water to test if the boat floats	1 per class
Safety	Goggles	1 per student
	Apron or lab coat	1 per student
Book	*Boxitects* by Kim Smith	1 per class

B

- Say, "Okay, it sounds like we are now ready to carry out our plans to figure out how we can make a toy car and boat with the same materials. I'm going to give you 20 minutes to collect your data."
- Give the students 20 minutes to collect their data.



Teaching Tip

- The car should have several pieces. Be sure to have students use caution when using the screwdriver. Students may ask for tape or similar materials to help construct the boat.
- Hand out the materials or have one student from each group collect the materials they need from a central supply table.

Find more Teaching Tips in the Learning Hub

C

- Walk around and check in with students as they carry out the investigation plan and collect data.
- After a few minutes, call for the attention of the entire class and say, "Don't forget to record what you see happen on your handout. We call this information data. You can use words, symbols, pictures, or numbers to keep track of your data. Please write down this information here on your handout (point to the box on the handout)."
- Allow the students to finish collecting data. Be sure to walk around the class as they work to check in and offer advice.


Transforming a Car into a Boat DO

Stage 4 – Do In this stage you and your group will follow all the steps of the investigation plan your class made. When we follow a plan to answer a question, we are doing an investigation.

Directions: Write or draw a picture of what you see and notice during the investigation in the box below.

173

Teaching Tip

One way to do a quick check-in with a group is to use the "two questions, a nudge, and a goal" technique, which includes the following steps:

1. Sit down with a group of students.
2. Ask, "Would one of you tell me a little about what you all have been doing or thinking about?" (Question 1)
3. A student answers on behalf of the group.
4. Ask, "Would anyone else like to add anything to that?" (Question 2)
5. A different student provides additional information on behalf of the group.
6. Ask, "Have you thought about [a hint or something you want to highlight]?" (A nudge)
7. Say, "Okay, I'm going to check on the other groups. When I get back, I want to see [something that you want the group to accomplish]." (A goal)

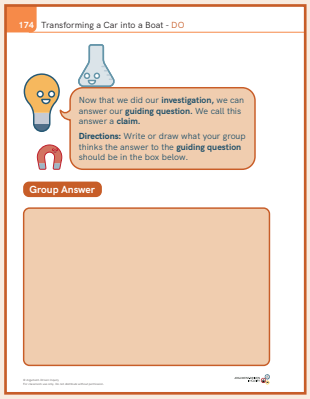
When you have completed the check-in with one group, move on to the next group.

Find more Teaching Tips in the Learning Hub

Stage 4: Activity 2 – Answer the Guiding Question

A

- Say, "Now that we did our investigation, we can answer our guiding question. Take a few minutes to talk in your groups and decide how to best answer the question: **How can we make a toy car and boat with the same materials?**"
- Give the students a few minutes to talk in their groups.


174 Transforming a Car into a Boat - DO

Now that we did our **investigation,** we can answer our **guiding question.** We call this answer a **claim.**

Directions: Write or draw what your group thinks the answer to the **guiding question** should be in the box below.

Group Answer

B

- Say, "Okay, it sounds like each group has an answer to the guiding question. Please write down or draw your group's answer or claim in the box on your handout."
- Give the students about five minutes to write down and/or draw their group's answer to the guiding question on their handouts.

Teaching Tip:

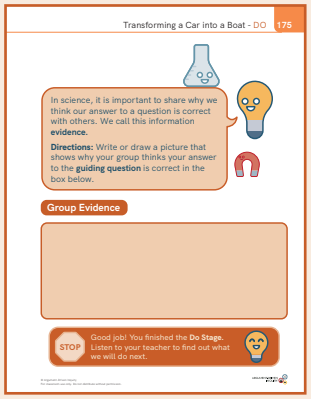
- Encourage your emerging multilingual students to speak using learning strategies such as requesting assistance, employing nonverbal cues, and using synonyms and circumlocution (conveying ideas by defining or describing when exact English words are not known) during this stage.
- Be sure to point out and/or draw emerging multilingual learners' attention to elements of the English sound system in newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters.

Find more Teaching Tips in the Learning Hub

Stage 4: Activity 3 – Provide Some Evidence

A

- Say, "Now that we have an answer to our guiding question, we need to think about why we think our claim is correct. Take a few minutes to talk in your groups about how you know that your claim is correct based on what you did and saw during your investigation."
- Give the students a few minutes to talk in their groups.



B

- Say, "Okay, it sounds like each group knows why their claim is correct. When we share this information or reasoning with others, we call it evidence. Please write down or draw your group's evidence for your claim in the box on your handout."
- Give the students about 10 minutes to write down and/or draw their evidence on their handout.

Teaching Tip

Add a list of high-frequency English words necessary for identifying and describing people, places, and objects accompanied by pictures to assist your emerging multilingual learners with routine language needed for classroom communication.

Find more Teaching Tips in the Learning Hub

Attending to Equity

- Be sure to intentionally group emerging multilingual students at times with peers who know the same languages as they do and at other times with peers whose English language development is slightly more advanced. Thoughtful grouping that varies throughout an investigation allows emerging multilingual students to benefit from the different linguistic resources of their peers.
- Assess students based on their contribution to the group, rather than solely on written or drawn components.

Transforming a Car into a Boat Teacher Lesson Plan

Stage 5 SHARE

Logistics

Time Needed	Physical Space	Group Size
30 minutes	Classroom	Whole class

Materials Needed

ADI Learning Hub	Student Handouts	Other Materials
Stage 5: Share	Stage 5: Share	Chart paper Marker pens

Learning Objectives

Students should make progress on their ability to do the following by the end of this stage of the lesson:

SCIENCE

1. Explore and describe how different materials have specific properties that influence their structure and function within a system (PS1.A).
2. Ask questions about how different materials can be used to build or modify objects (SEP1).
3. Collect and analyze data to identify patterns and relationships between material properties and their functions (SEP4).
4. Engage in discussions to share their findings, using evidence to explain the choices of materials based on their properties (SEP7).
5. Communicate their conclusions about material properties through various formats, including pictures and verbal explanations (SEP8).

WIDA ENGLISH LANGUAGE DEVELOPMENT STANDARDS FOR SCIENCE

1. Use visual and context clues to describe the structure and function of materials and explain how small parts can form larger objects (Explain).
2. Participate in discussions, providing evidence-based arguments about how the properties of materials make them suitable for specific purposes (Argue).

COMMON CORE ENGLISH LANGUAGE ARTS

1. Ask and answer questions about key details in texts related to how materials are used and combined for different purposes (CCSS.ELA-LITERACY.RI.2.1).
2. Engage in collaborative discussions, sharing their thoughts on how materials can be assembled and listening to others' ideas (CCSS.ELA-LITERACY.SL.2.1).

Stage 5: Activity 1 – Share What You Figured Out

A

- Say, "You and your group will now share what you figured out and how you know that you are correct with the rest of the class."
- Say, "Red Team, will you come up front and share what you figured out?"
- Give the Red Team three or four minutes to share their claim and evidence.
- Ask the class, "Do you all agree or disagree with their claim, and why?"
- Allow students a few minutes to discuss. Be sure to ask your own questions as well.
- Say, "Thank you, Red Team. You can go sit back down now."

B

- Say, "Blue Team, will you come up front and share what you figured out?"
- Give the Blue Team three or four minutes to share their claim and evidence.
- Ask the class, "Do you all agree or disagree with their claim, and why?"
- Allow students a few minutes to discuss. Be sure to ask your own questions as well.
- Say, "Thank you, Blue Team. You can go sit back down now."

C

- Repeat Step B for each team in your class.

Teaching Tip

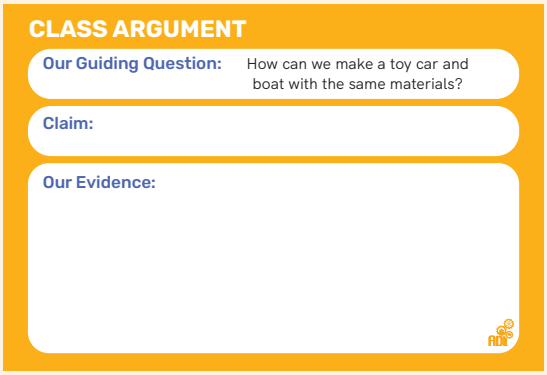
The more students talk during this activity, the more meaningful the experience will be for them and the more you can learn about their thinking. Be sure to use talk goals and moves to help facilitate the discussion. Also, encourage students to focus on the accuracy or quality of the evidence if they do not agree with a presented claim.

Find more Teaching Tips in the Learning Hub

Stage 5: Activity 2 – Create a Final Argument

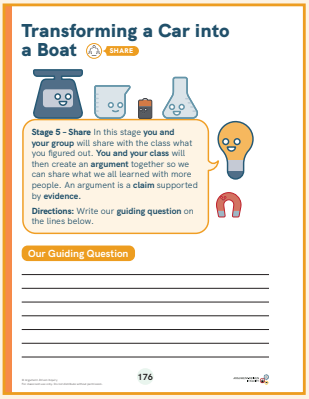
A

- Say, "Okay, now that we have heard from all the groups, we are going to create a final argument together so we can share what we learned with our families or caregivers."
- Say, "Our first step is to let them know what we were trying to figure out. To do that we need to share our guiding question."
- Write the guiding question, "**How can we make a toy car and boat with the same materials?**" on the Class Argument anchor chart.



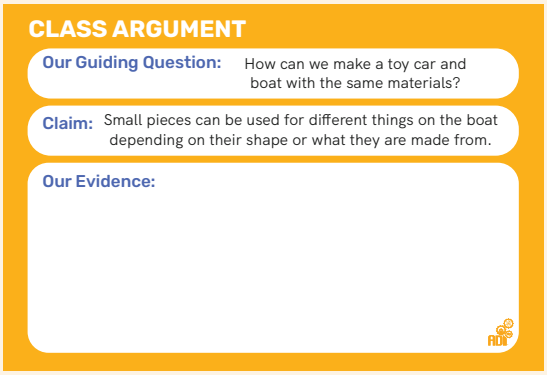
B

- Ask, "Okay, will you all copy this guiding question on to your handout?"
- Give the students about three minutes to write down the guiding question on their handouts.



C

- Say, "Now that we have our guiding question written down, we need to decide on our class answer to that question."
- Ask, "What do you think our answer, or claim, should be?"
- Allow students to share.
- Ask, "Do we all agree with this claim, and why?"
- If students disagree with the claim, keep asking the students to share ideas about what the claim should be until they all agree.
- Once everyone in the class agrees with the content of the claim, write it on the anchor chart.



D

- Ask, "Okay, will you all copy this claim to your handouts?"
- Give the students about three minutes to write down the claim on their handouts.

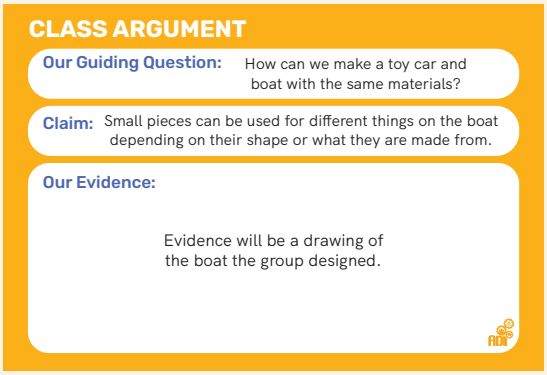

Transforming a Car into a Boat - SHARE 177

Directions: Write the **claim** you and your class decided to use to answer the **guiding question** on the lines below.

Our Class Claim

E

- Say, "Now that we have our claim written down, we need to decide on how to support our claim with evidence. Evidence is information from our investigation that we can use to show others that our claim is correct."
- Ask, "What do you think we should use as evidence in our argument?"
- Allow students to share.
- Ask, "Do we all agree with this evidence, and why?"


CLASS ARGUMENT

Our Guiding Question: How can we make a toy car and boat with the same materials?

Claim: Small pieces can be used for different things on the boat depending on their shape or what they are made from.

Our Evidence:

Evidence will be a drawing of the boat the group designed.

- If students disagree with the evidence, keep asking the students to share ideas about what the evidence should be until they all agree.
- Once everyone in the class agrees with the content of the evidence, write it on the Class Argument anchor chart.

F

- Ask, "Okay, will you all copy this evidence to your handout?"
- Give the students about three minutes to write down the evidence on their handouts.


178 Transforming a Car into a Boat - SHARE

Directions: Write or draw the **evidence** you and your class decided to use to show that the **claim** is correct in the box below.

Our Class Evidence

STOP Good job! You finished the **Share Stage**. Listen to your teacher to find out what we will do next.

Teaching Tip:

- Be sure to use visual and contextual cues to enhance and confirm understanding of spoken language to help support emerging multilingual learners during this stage.
- The claim should be something similar to, "Small pieces can be used for different things on the boat depending on their shapes or what they are made from."
- The evidence should be a picture and words or numbers and a simple graph that shows how the group reassembled the car parts into a boat that floats.

Find more Teaching Tips in the Learning Hub

ADI Go Digital

Visit the Learning Hub to download Anchor Charts for your classroom. You can find them by going to the Investigation Dashboard and clicking on Investigation Downloads.

Teacher Notes

Transforming a Car into a Boat Teacher Lesson Plan

Stage 6 REFLECT

Logistics

Time Needed	Physical Space	Group Size
30 minutes	Classroom	Whole class

Materials Needed

ADI Learning Hub	Student Handouts	Other Materials
Stage 6: Reflect	Stage 6: Reflect	Chart paper Marker pens *Boxitects* by Kim Smith

Learning Goals

Students should make progress on their ability to do the following by the end of this stage of the lesson:

SCIENCE

1. Explore and describe how different materials have specific properties that influence their structure and function within a system (PS1.A).
2. Examine parts of a whole to define or model a system and understand the relationship between structure and function (CC1).
3. Ask questions about how different materials can be used to build or modify objects (SEP1).
4. Construct explanations and propose solutions for how material properties affect their use in different designs (SEP6).
5. Engage in discussions to share their findings, using evidence to explain the choices of materials based on their properties (SEP7).
6. Communicate their conclusions about material properties through various formats, including pictures and verbal explanations (SEP8).

WIDA ENGLISH LANGUAGE DEVELOPMENT STANDARDS FOR SCIENCE

1. Use visual and context clues to describe the structure and function of materials and explain how small parts can form larger objects (Explain).
2. Participate in discussions, providing evidence-based arguments about how the properties of materials make them suitable for specific purposes (Argue).

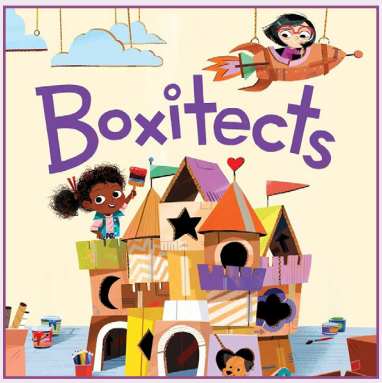
WIDA ENGLISH LANGUAGE DEVELOPMENT STANDARDS FOR SCIENCE

1. Ask and answer questions about key details in texts related to how materials are used and combined for different purposes (CCSS.ELA-LITERACY.RI.2.1).
2. Engage in collaborative discussions, sharing their thoughts on how materials can be assembled and listening to others' ideas (CCSS.ELA-LITERACY.SL.2.1).

Stage 6: Activity 1 – A Story About This Phenomenon

A

- Say, "We are now going to read a book called *Boxitects*. This book was written by Kim Smith."
- Complete a read-aloud with students in a common whole-group meeting area. Read aloud the entire book.



Teaching Tip:

- Make sure to share and discuss the illustrations in the book because they support the meaning of the text.
- Stop to provide word meanings or clarification as needed.

Find more Teaching Tips in the Learning Hub

Stage 6: Activity 2 – Discuss the Story

A

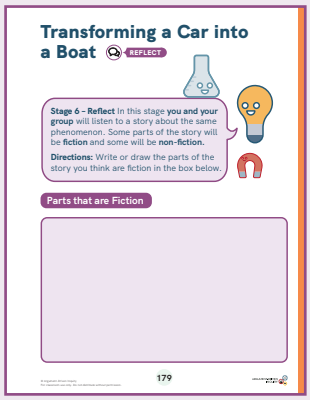
- Say, "Okay, that story was about using things to build other things. Some parts of the story were fiction, and some were nonfiction."
- Ask "What do we mean when we say something is fiction and how is that different from something that is nonfiction?"
- Allow students to share their ideas.
- Say, "Okay, fiction means something that describes imaginary events or things. Nonfiction means something that is based on facts, real events, or real people."
- Write these fiction and nonfiction things on a Reflect Stage anchor chart.

B

- Say, "We are now going to come up with a list of things in the book that were fiction."
- Ask, "Who would like to share an idea?"
- If the idea that is shared is fiction, say, "That is a good example," and write it on the anchor chart. If the idea that is shared is nonfiction, say, "That happened in the book but that is a fact, so it is nonfiction."

C

- Say, "Okay, this is a good list. Will you all write or draw these ideas on your handouts where it says 'Parts that are fiction'?"
- Show the students where to draw or write on their handouts.
- Give the students about five minutes to add the information to their handouts.

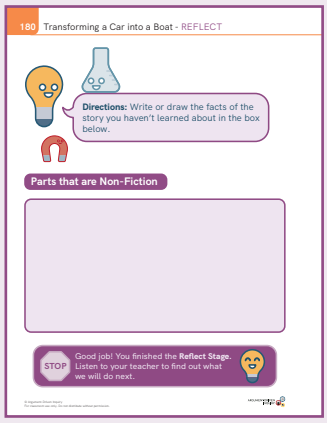


D

- Say, "We are now going to come up with a list of things in the book that were nonfiction."
- Say, "Who would like to share an idea?"
- If the idea that is shared is nonfiction, say, "That is a good example," and write it on the anchor chart. If the idea that is shared is fiction, say, "That happened in the book but that is imaginary, so it is fiction."

E

- Say, "Okay, this is a good list. Will you all write or draw these ideas on your handouts where it says 'Parts that are non-fiction'?"
- Show the students where to draw or write on their handouts.
- Give the students about five minutes to add the information to their handouts.


180 Transforming a Car into a Boat - REFLECT

Directions: Write or draw the facts of the story you haven't learned about in the box below.

Parts that are Non-Fiction

STOP Good job! You finished the **Reflect Stage**. Listen to your teacher to find out what we will do next.

Attending to Equity

- This activity is a discussion, not a presentation about what the students "should have seen" or "should have learned" during the investigation. The more students talk during this activity, the more meaningful the experience will be for them and the more you can learn about their thinking.
- Provide emerging multilingual students with opportunities to talk in small groups before asking them to share with the entire class during this activity.
- Small-group structures offer all students, including emerging multilingual students, a chance to engage in sense-making with their peers as well as space to use their verbal and nonverbal (e.g., writing, drawing pictures, and using gestures) resources to express their ideas.
- Small-group structures also give students a chance to learn from other students' use of these resources. When students are tasked with expressing their ideas, be sure to encourage them to do so through multiple modes (speaking, writing, drawings, and gestures).
- Be sure to ask students how the topic relates to their lives; this will make learning engaging and relatable.

Teacher Notes

Transforming a Car into a Boat Teacher Lesson Plan

Stage 7 REPORT

Logistics

Time Needed	Physical Space	Group Size
60 minutes (over two days)	Classroom	Individual

Materials Needed

ADI Learning Hub	Student Handouts	Other Materials
Stage 7: Report	Stage 7: Report	Report review guide Final report rubric

Learning Goals

Students should make progress on their ability to do the following by the end of this stage of the lesson:

SCIENCE

1. Demonstrate that small units, such as building blocks, can be combined or reassembled to form new objects and will explain material choices based on their physical properties (2-PS1-3).
2. Explore and describe how different materials have specific properties that influence their structure and function within a system (PS1.A).
3. Examine parts of a whole to define or model a system and understand the relationship between structure and function (CC1).
4. Develop models (e.g., diagrams or physical models) to show how materials can be combined to form new objects (SEP2).
5. Collect and analyze data to identify patterns and relationships between material properties and their functions (SEP4).
6. Use mathematical skills to classify, record, and organize data about material properties and structures (SEP5).
7. Construct explanations and propose solutions for how material properties affect their use in different designs (SEP6).
8. Communicate their conclusions about material properties through various formats, including pictures and verbal explanations (SEP8).

WIDA ENGLISH LANGUAGE DEVELOPMENT STANDARDS FOR SCIENCE

1. Use visual and context clues to describe the structure and function of materials and explain how small parts can form larger objects (Explain).

COMMON CORE ENGLISH LANGUAGE ARTS

1. Ask and answer questions about key details in texts related to how materials are used and combined for different purposes (CCSS.ELA-LITERACY.RI.2.1).
2. Write informative texts explaining their observations of materials and the reasons behind choosing specific materials for different designs (CCSS.ELA-LITERACY.W.2.2).

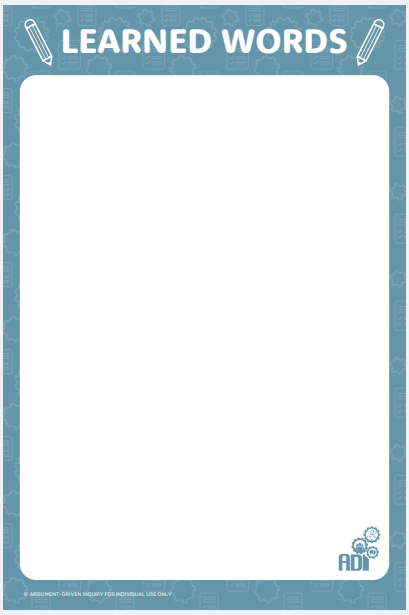
COMMON CORE MATH

1. Fluently add and subtract within 100 as they quantify and compare material properties (CCSS.MATH.CONTENT.2.NBT.B.5).
2. Use addition to categorize materials and form groups based on their properties (CCSS.MATH.CONTENT.2.OA.C.4).
3. Create picture and bar graphs to represent data about material properties, such as size, weight, or flexibility (CCSS.MATH.CONTENT.2.MD.D.10).

Stage 7: Activity 1 – Learned Words

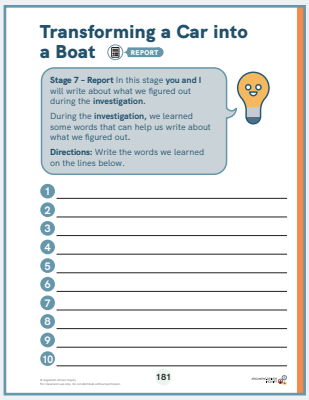
A

- Say, "As we have gone through this investigation, we have learned a lot of new words. Which words do you think are the most important?"
- Allow students to share words one at a time. As they share a word, ask them to explain what the word means.
- Ask, "Do we all agree with this definition?" If students agree and the definition is correct, add the word to the class Learned Words chart.
- If students disagree or they agree with an inaccurate definition, clarify the definition and then add the word to the class Learned Words chart.
- Continue until students are finished sharing words.



B

- Say, "Okay, that is a pretty good list. Please add these words to your handouts so you can use them to write about what you figured out."
- Show them where to write the words on their handouts.
- Give the students about five minutes to copy down the list of words.


Transforming a Car into a Boat
REPORT
Stage 7 – Report In this stage you and I will write about what we figured out during the investigation.
During the investigation, we learned some words that can help us write about what we figured out.
Directions: Write the words we learned on the lines below.
1
2
3
4
5
6
7
8
9
10
181

Teaching Tip

A word bank on the wall of high-frequency, high-need concrete vocabulary that is needed to communicate science ideas is helpful for all students, especially emerging multilingual students, who are learning to speak and write in science.

Find more Teaching Tips in the Learning Hub

Stage 7: Activity 2 – Write a Draft Report

A

- Say, "Okay, now that we have a list of the words we learned ready, we can write about what we figured out. When scientists write about what they figured out during an investigation, they call it a report. You are going to write a report today so you can share what you learned with your family or caregivers."
- Point to the first section of the report.
- Say, "In this section, you can write our class claim. I'm going to give you 10 minutes to write that part of your report."
- Give the students 10 minutes to write. Be sure to walk around and help the students who get stuck.


182 Transforming a Car into a Boat - REPORT

Now that we have our learned words ready, we can write about what we figured out. When scientists write about what they figure out, they call it a **report**.

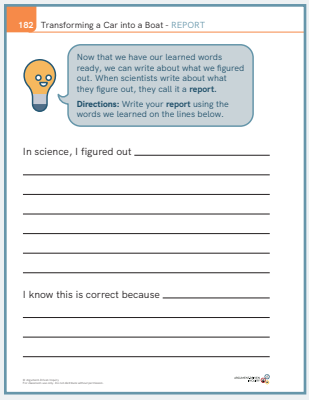
Directions: Write your **report** using the words we learned on the lines below.

In science, I figured out _____

I know this is correct because _____

B

- Say, "Okay, now we are going to share our evidence."
- Point to the second section of the report.
- Say, "In this section, you can write our class evidence. I'm going to give you 10 minutes to write that part of your report."
- Give the students 10 minutes to write. Be sure to walk around and help the students who get stuck.


182 Transforming a Car into a Boat - REPORT

Now that we have our learned words ready, we can write about what we figured out. When scientists write about what they figure out, they call it a **report**.

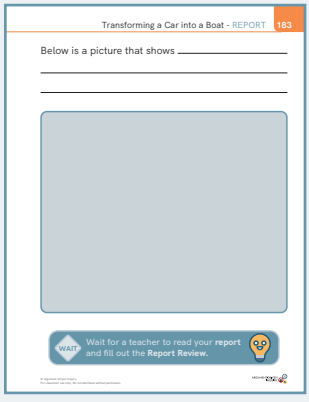
Directions: Write your **report** using the words we learned on the lines below.

In science, I figured out _____

I know this is correct because _____

C

- Say, "Okay, now we are going to share a picture of what we saw during our investigation."
- Point to the third section of the report.
- Say, "In this section, you can draw a picture of what you saw or did. Be sure to include words to explain your picture. I'm going to give you 10 minutes to write and draw that part of your report."
- Give the students 10 minutes to write and draw. Be sure to walk around and help the students who get stuck.


Transforming a Car into a Boat - REPORT 183

Below is a picture that shows _____

WAIT Wait for a teacher to read your **report** and fill out the **Report Review.**

D

- Collect all the reports.
- Read over each report after class and give each student feedback using the Report Review guide.

Report Review	
Is the claim (what the author figured out) scientifically correct?	☐ Yes ☐ Somewhat ☐ No
Did the author do a good job using evidence to support their claim?	☐ Yes ☐ Somewhat ☐ No
Do all the sentences in the report make sense?	☐ Yes ☐ Somewhat ☐ No
Are all the words in the report spelled correctly?	☐ Yes ☐ Somewhat ☐ No
Is all the punctuation in the report correct?	☐ Yes ☐ Somewhat ☐ No
Are all upper and lowercase letters in the report correct?	☐ Yes ☐ Somewhat ☐ No
What can the author do to improve their report? Please be as specific as possible.	

Teaching Tip

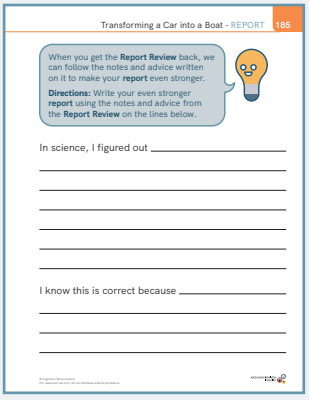
If this is the first time completing the report, model how to write each section. If you have completed this before, have students work on it in sections. You can also create a class "gotta-have-it" list of information that needs to be included in each section of the report. Students can then refer to this list as they write each section.

Find more Teaching Tips in the Learning Hub

Stage 7: Activity 3 – Create a Final Report

A

- Say, "Okay, now we are going to make our reports even stronger."
- Hand back the reports and Report Review guides.
- Say, "You can now use the notes and advice written on the report or the Report Review guide to revise your report and make each section better."
- Say, "Let's look at the claim first. Look for things you can fix. Once you have identified at least one thing to fix, you can write your new claim here on your handout."
- Point to the "In science, I figured out" section of the handout.
- Say, "I'm now going to give you 10 minutes to rewrite this part of your report."
- Give the students 10 minutes to write. Be sure to walk around and help the students who get stuck.


Transforming a Car into a Boat - REPORT 185

When you get the **Report Review** back, we can follow the notes and advice written on it to make your **report** even stronger.

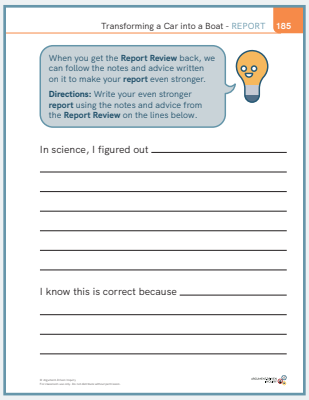
Directions: Write your even stronger **report** using the notes and advice from the **Report Review** on the lines below.

In science, I figured out _____

I know this is correct because _____

B

- Say, "Okay, now we are going to revise our evidence."
- Point to the second section of the report.
- Say, "You can now use the notes and advice written on the report or the Report Review guide to revise your report to make your evidence better."
- Say, "Let's look at the feedback you got. Look for things you can fix. Once you have identified at least one thing to fix, you can write your new evidence here on your handout."
- Point to the "I know this is correct because" section of the handout.
- Say, "I'm now going to give you 10 minutes to rewrite this part of your report."
- Give the students 10 minutes to write. Be sure to walk around and help the students who get stuck.


Transforming a Car into a Boat - REPORT 185

When you get the **Report Review** back, we can follow the notes and advice written on it to make your **report** even stronger.

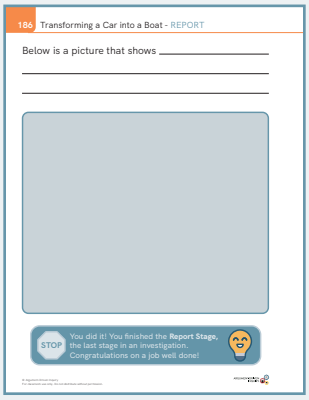
Directions: Write your even stronger **report** using the notes and advice from the **Report Review** on the lines below.

In science, I figured out _____

I know this is correct because _____

C

- Say, "Okay, now we are going to revise our pictures of what we did."
- Point to the third section of the report.
- Say, "You can now use the notes and advice written on the report or the Report Review guide to revise your report to make your picture better."
- Say, "Let's look at the feedback you got. Look for things you can fix. Once you have identified at least one thing to fix, you can draw your picture and explain it on your handout."
- Point to the "Below is a picture that shows" section of the handout.
- Say, "I'm now going to give you 10 minutes to rewrite this part of your report."
- Give the students 10 minutes to write. Be sure to walk around and help the students who get stuck.


186 Transforming a Car into a Boat - REPORT

Below is a picture that shows _____

STOP You did it! You finished the **Report Stage**, the last stage in an investigation. Congratulations on a job well done!

D

- Collect all the final draft reports.
- Read over each report after class and grade each one using a new Report Review guide.
- After you are done grading, send the report home so students can share what they have learned about in science.

Teaching Tip

If this is the student's first time getting feedback on a report, be sure to (a) explain the rubric and (b) model how to use feedback to improve their writing.

Find more Teaching Tips in the Learning Hub

Attending to Equity

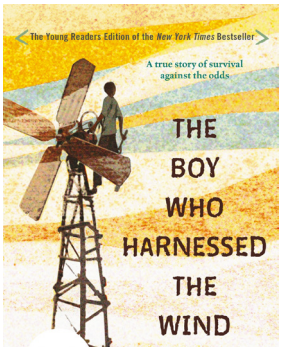
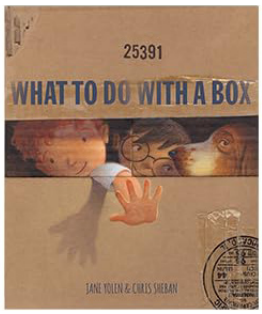
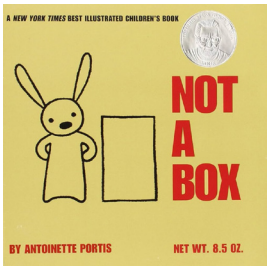
- Emerging multilingual students' access to instructional tasks that require complex thinking, such as writing a report, is enhanced when linguistic complexity and instructional support match their levels of language proficiency. Therefore, it is important to scaffold the writing of the draft reports for emerging multilingual students based on their current English language proficiency levels.
- The use of sentence starters to model written language production skills can help emerging multilingual students develop English language skills because the development of academic language and academic content knowledge are interrelated processes. However, it is important that such scaffolds be used purposefully and be removed when no longer needed.
- Students do not always use the feedback they receive to improve the quality of their reports. Make sure you move from student to student and encourage them to make changes based on the feedback. If students are not sure how to revise their reports, model how to use feedback.

Transforming a Car into a Boat Teacher Lesson Plan

Literacy Connections

Additional Trade Books for Students

The following books are a great extension for students when learning about using physical properties and materials to design and build something new. The list also includes the reading Lexile levels of the books.

Book	Title	Author and Illustrator	Lexile Level
	*The Boy Who Harnessed the Wind*	William Kamkwamba (Author) Bryan Mealer (Author) Anna Hymas (Illustrator)	860L
	*What to do with a Box*	Jane Yolen (Author) Chris Sheban (Illustrator)	450L
	*Not a Box*	Antoinette Portis (Author, Illustrator)	240L