"Tales of the Resolution"

Student Page: Episode 1

Episode 1 "Tales of the Resolution" (http://joidesresolution.org/node/3309)

Directions:
1. Read the Tales of the Resolution
2. Answer all questions below to test your understanding of the story and the science and your comprehension.
3. Perform any extension activities listed below your questions.

1. What are three important reasons for operating the *JR* and other drilling platform ships?

2. Four steps in collecting seafloor materials include:

W) A cylinder of mud or rock (core) fills the drill pipe in 9.5 m (30-ft.) sections

X) Cores are brought up to the ship and prepared for study.

Y) Rotating cones on the bit rotate as the drill string rotates

Z) The drill bit is lowered to the seafloor on the end of a drill string

What sequence of letters represent the correct order of these steps? _____

3. What kind of information can be discovered by borehole logging that adds to what is learned from the cores?

(A) Identification of fish and other seafloor organisms

(B) Measurements of earthquakes on the ocean floor

(C) Physical characteristics of the sediments or rocks that were cored

(D) Samples of the seawater for chemical testing in shipboard laboratories

4. When did scientific ocean drilling for Earth Science research begin? How many years ago is this?

5. What do scientists call the data collected from specialized tools sent down the borehole?

Student Page: Episode 2

For Episode 2 "Re-Fit Madness"

Directions:
1. Read the Tales of the Resolution
2. Answer all questions below to test your understanding of the story and the science and your comprehension.
3. Perform any extension activities listed below your questions.

1. During its first 20 years of exploration, the *JOIDES Resolution* made many discoveries. Some of these are included in an online activity called "Treasure Chest of Cores" (http://joidesresolution.org/node/273).

Select one or more of these cores and explain their importance in deciphering Earth's history.

2. Match each part of the *JOIDES Resolution* with what happens in that location.

A. Accommodations	1. Area in the rear of the ship where helicopters can land and take off
B. Bridge	2. Bottom of the ship that floats in the water
C. Derrick	3. Captain and crew control the ship, science operations are planned
D. Helipad	4. Kitchen and dining area
E. Hull	5. Multi-story structure that contains the scientific laboratories
F. Labstack	6. Rooms where crew and scientists sleep
G. Mess and galley	7. Tower-like structure that can lift and position the drill string

3. Re-fitting the JR involved many steps that had to be carried out in an organized order. Below is an alphabetical list of 18 important steps. Read the episode and make notes to learn what happened during the re-fitting. Use the list below to show the sequence of events by listing each step's letter in the correct order in the table. Give a reason why each step had to happen before the next step.
   A. Barnacles and other materials were sandblasted off the hull

B. Construction of bridge, lab modules, and offices

C. Demolition of the bridge and removal of the bridge module.

D. Demolition of the lab and removal of the lab stack

E. Installation of computer network

F. Installation of electrical and computer network cables

G. Leaving the shipyard dry-dock for sea trials

H. New accommodation quarters were constructed below the main deck

I. New bridge constructed and installed

J. New deck was installed.

K. New galley and mess

L. New lab stack constructed and installed

M. Placement of new lifeboats

N. Propellers were removed, cleaned, and reassembled

O. Removal of the derrick

P. Replacement of the refurbished derrick

Q. The hull was completely repainted

R. Towing into the dry-dock.

Step	Letter	Reason this step goes before the next step
1		
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Student Page: Episode 3

For Episode 3 "Resolution Reloaded "

Directions:
1. Read the Tales of the Resolution
2. Answer all questions below to test your understanding of the story and the science and your comprehension.
3. Perform any extension activities listed below your questions.

1. Assessing whether the JR was ready to begin scientific operations after its renovation was a 7-member group. What was the title for this group? What was its acronym? Why do we often use acronyms?

2. Give two reasons why "outside evaluators" are important in determining the effectiveness of a program.

3, Match the job title with the activity:

1. Captain	A. Conducts the scientific investigations
2. Core curator	B. Describes and catalogs every core
3. Engineer	C. Keeps the ship and all equipment working
4. First Mate	D . Manages equipment in the science labs
5. Head of Food services	E. Runs the drilling operations when the ship is on site
6. Lab officer	F. Runs the drilling operations during the other shift
7. Logging staff scientist	G. Supervises the galley and mess
8. Offshore installation manager	H. Sends the instrument string into the hole
9. Scientist	I. Steers the ship so it doesn't crash or run into anything
10. Senior Tool Pusher	J. Steers the ship during the other shift

You can find out more about marine careers from the JR website Resources section (http://joidesresolution.org/node/904).

4. How long is each core when it is brought up and carried to the receiving platform?

5. What is the length of each segment after the core is cut? Why is it useful to cut it down?

6. Learn more about "What Is a Core?"

7. When cores are retrieved, they are first sent through a series of instruments. Complete the table by writing a brief description of what can be measured by each instrument.

Instrument	Physical properties measured by this instrument
Multi-sensor track system	
P-wave Logger	
Digital imaging system	
Color reflectance system	

8. After the core has been retrieved, specialized instrument on the wireline logging system are lowered into the borehole. Based on what you read in this episode, list at least three things that can be learned from studying the four columns that make up the "picture" of the borehole wall?

9. You can learn more about the value of borehole logging through "It's Not Just the Core that Tells the Hole Story."

Writing across the Curriculum

- Imagine you have been selected to write blogs about the expedition.
    - What would you include in a blog about what life is like aboard the JR during your non-working shift?
    - What would you blog about the scientific activities taking place during this expedition?
- Use the information provided in this episode to write what needs to be done to retrieve a core at the selected drilling site. Begin with hoisting the stored pipes into a vertical position, and end with the core being carried to the receiving platform.

Student Page: Episode 4

For Episode 4 "Arctic Rainforest"

Directions:

1. Read the Tales of the Resolution

2. Answer all questions below to test your understanding of the story and the science and your comprehension.

3. Perform any extension activities listed below your questions.

1. In this episode, our planet is described as once being a "Greenhouse World," but now is an "Icehouse World." What do scientists mean by these phrases? What evidence has been found that indicates Earth was much warmer 50 million years ago than it is now?

2. What are some kinds of materials scientists try to obtain from sea floor cores to determine past climate conditions? Why are these useful to interpreting ancient climates?

3. Why did the scientists on this JR expedition choose this particular study area?

4. Whose job is it on a JR expedition to determine the age of the core materials? What do they use to estimate the sediment age?

5. Give a brief explanation of why the older parts of the cores were dark with no calcium carbonate shells, and the younger upper parts were full of carbonate microfossils.

6. Based on the expedition's findings, when did Earth experience a dramatic change occur from older sediments with no calcium carbonate to young sediments filled with calcium carbonate? What probably happened at that time period?

You can learn more about the expedition by watching the PEAT News Network at http://joidesresolution.org/node/2110.

Enrichment:
Read about "The Fate of Calcium Carbonate" on the American Chemical Society website:
http://www.melodyshaw.com/files/The_Fate_of_Calcium_Carbonate.pdf

If you try this experiment, write a "lab report" for your teacher in the appropriate style used in your school. As an alternative, follow this style:

Purpose - Give the reasons why you do this and the key questions.
Procedure - State clearly and concisely the steps you followed.
Results - Present what you found in words and, if appropriate, graphs and tables.
Discussion - Explain the meaning of your results and answers to the key questions.
Summary (Conclusion)- Provide a short recap of what you did and found.
Acknowledgements and References - Thank people who helped and cite print and online references used.

Student Page: Episode 5

For Episode 5 "Choose Your Own Tale of the Resolution! Jobs on the JR"

Directions:
1. Read the Tales of the Resolution
2. Answer all questions below to test your understanding of the story and the science and your comprehension.
3. Perform any extension activities listed below your questions.

1. An ACORK is a tool system that
   A. floats like a cork on the surface
   B. penetrates the sediments to collect data from below the seafloor
   C. rises and falls through the water column
   D. slowly crawls over the sea floor like the Mars rovers

2. What is the purpose of each of these parts? Complete the chart.

Component	**Purpose**
Casing	
Cement and bridge plug	
Data recorder	
Hanger	
Hydraulic umbilical	
Re-entry cone	
ROV platform	
Screens	
Well head	

3. If all goes according to the research design, for how long will the ACORK remain on the sea floor? What are the benefits of conducting research for such a long time period?

4. How, at first, will the data be retrieved? What are longer-term plans to obtain the data? What probable assumptions were made to design the data collection in this way?

Writing across the Curriculum

Imagine you are one of the people from the JR featured in this episode, and have been invited to talk at a school like yours. Below are sets of questions that the students would like to have answered in your talk. Based on what you read in this episode and other knowledge, what would be your answers to the questions?

- Questions for the Scientist:
  What is your area of scientific expertise?
  Why is it helpful to have knowledge from many different subjects?
  What do you hope to learn through this expedition?

- Questions for the Welder:
  What do you do in your job on the JR?
  Where did you get the experience needed to land this job?
  How do you keep yourself safe when you are welding?

- Questions for the Engineer:
  What is your basic job aboard the JR?
  What did you do before this that helped you do your job on the JR well?
  Why is it important to be very precise in your work?

- This episode focuses on a problem with an important piece of the ACORK. Use the information in this episode to write a report about it to the Ocean Drilling Board of Directors. Here are points to include:
  - What was the problem?
  - Why was it important to correct the problem before the ACORK was put in place?
  - How as the problem solved by the engineer?
  - How was the problem solved by the welder?

Technology Enrichment

You can't make a real ACORK, but you can make a scale model. Use the diagram provided in the episode as your guide. Here are some questions to consider as you work.

1) Trace or photocopy the diagram of the ACORK on page 3. Decide how you should measure the length of each part in the drawing so you will have the same relative size in your model? Be aware that the actual ACORK was over 300 feet (100 m) in length and about 2 ft (0.7 m) in diameter.)
2) What materials will you use to build the model? Describe the advantages and disadvantages of these and other materials?
3) How will you set up the model for display? How will you label the sections?
4) What other information should you include in your finished model to explain what ACORKs can do?

This activity could be presented as a competition among groups in the school, with a "science fair" to share efforts and judge effectiveness.

Student Page: Episode 6

For Episode 6: "In Search of Ancient Lava Flows"

Directions:
1. Read the Tales of the Resolution
2. Answer all questions below to test your understanding of the story and the science and your comprehension.
3. Perform any extension activities listed below your questions.

1. Use a world map to locate the Louisville Seamounts. In what region of the ocean are they found? What is their approximate latitude and longitude? How far away are they from some better-known geographic locations?

2. What scientific questions does this expedition seek to answer?

3. When did the Chief Scientist first announce his inspiration for this expedition? Why did it take such a long time before he could put to sea?

4. What are seamounts? How do they form? What makes seamounts like the Louisville or Hawaii-Emperor seamounts unusual and worth the effort of this expedition?

5. What evidence are the scientists looking for in recovered lava flows?

6. This Tale focuses on solving problems that can occur while at sea during an expedition.

What was the problem that suddenly developed during the drilling and core recovery?

7. How did the JR engineers and drilling crew finally solve the problem of the stuck drill bit?

8. What safety measure did everyone aboard have to take to avoid an accident when the plan for solving the problem was put in place? Why was this necessary?

9. Did their solution work? What was the next problem the expedition had?

10. What problem was found at the new hole with regard to the original scientific question? What was recovered? Why couldn't these rocks be used to answer the question?

11. What do sedimentologists study? Petrologists? Alteration petrologists?

12. After the ship finished this expedition at sea, what plans did the scientists have to continue their research on land?