"Tales of the Resolution"

Student Page Episode 1

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

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. Which of the following can be discovered by borehole data?

   (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?

"Re-Fit Madness"

Student Page: Episode 2

Episode 2 "Re-Fit Madness" (http://joidesresolution.org/node/3310)

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

6. Re-fitting the JR involved many organized steps, including those below. After reading the episode sequence events in correct order in the table. Give a reason why each step had to happen in this order.

A. Construction of bridge, lab modules, and offices

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

C. Installation of electrical and computer network cables

D. Leaving the shipyard dry-dock for sea trials

E. New bridge constructed and installed

F. Placement of new lifeboats

G. Propellers were removed, cleaned, and reassembled

H. Removal of the derrick

I. Replacement of the refurbished derrick

J. The hull was completely repainted

K. Towing into the dry-dock

Step	Letter	Reason this step goes before the next step
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

"Resolution Reloaded"

Student Page: Episode 3

Episode 3 "Resolution Reloaded" (http://joidesresolution.org/node/3311)

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:

Captain	A. Conducts the scientific investigations
Core curator	B. Describes and catalogs every core
Engineer	C. Keeps the ship and all equipment working
First Mate	D . Manages equipment in the science labs
Head of food services	E. Runs the drilling operations when the ship is on site
Lab officer	F. Runs the drilling operations during the other shift
Logging staff scientist	G. Supervises the galley and mess
Offshore installation manager	H. Sends the instrument string into the hole
Scientist	I. Runs and steers the ship
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).

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

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

9. Read "What Is a Core?". Describe one important thing that you learned about cores.

10.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	

11. 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?

12. 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.

“Arctic Rainforest”

Student Page: Episode 4

Episode 4 “Artic Rainforest” (http://joidesresolution.org/node/3312)

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.

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

Student Page: Episode 5

Episode 5 "Choose Your Own Tale of the Resolution! Jobs on the JR"
(http://joidesresolution.org/node/3314)

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?

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.

“In Search of Ancient Lava Flows”

Student Page: Episode 6

Episode 6 “In Search of Ancient Lava Flows”
(http://joidesresolution.org/node/3313)

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 investigate?

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?