



# Crystal Ball for Critters (Learning Experience #1)

## Opportunities for Student Assessment



Opportunities for ongoing formative assessment are embedded throughout the learning experience in questions that spark class discussions. In addition, student datasheets, journal entries and class presentations also serve as formative assessments as the students work through the learning experience. The summative assessment for this learning experience is *What's Next for Hellbenders* (Student Sheet #3). In addition, all students should be able to answer the essential question for the scenario and learning experience.

### Student Science Journals

Journaling is an important part of a practicing scientist's day to day work. Student-scientists should reflect, write and draw in a journal or notebook as they answer questions and plan next steps in the problem solving process. Entries should be dated and labeled with names of team contributors and a note about where the team is in the planning process. Occasional journal review by the teacher provides an informal assessment of students' progress and their understanding of the content. Sharing the rubric with the students when you introduce the learning experience will help students meet teacher expectations for quality work.

### Suggested Student Journal Rubric for Crystal Ball for Critters (LE1)

Criteria		N/A	Missing	Below Expectations	Meets Expectations	Exceeds Expectations
Video notes and reflection						
Journal question: <i>What is a bioindicator species?</i>						
Essential question: How does climate change affect a bioindicator species?						
Essential question: What can a bioindicator species, such as the hellbender, tell us about the effects of climate change on its habitat?						
Lab question: importance of a cold stream habitat						
Reflection about climate change and extinction rates						
Other journal notes						



### Suggested Rubric for Hot or Cold Tub (LE1; Student Sheet #2)

Criteria	N/A	Missing	Below Expectations	Meets Expectations	Exceeds Expectations
Evidence of research; sources listed					
Detailed information about the chosen species: habitat, niche					
Detailed information about effects of climate change on the chosen species					
Clear proposal for conservation					
Inclusion of all team members in research and knowledge					
Creativity shown in presentation					

### Suggested Rubric for What's Next for Hellbenders? (LE1; Student Sheet #3)

Criteria	N/A	Missing	Below Expectations	Meets Expectations	Exceeds Expectations
Q: Warmer stream and DO level					
Q: Importance of DO level to hellbenders					
Q: Hellbender migration					
Q: Adaptation to a warmer environment					
Inclusion of all team members in research and knowledge					
Creativity shown in presentation					



## Cross Curricular Connections

### Literacy

The research and reflective writing assignments incorporated in this scenario may be completed as part of an English assignment. Students should be guided to research-based websites that are posted and maintained by reputable institutions such as the Environmental Protection Agency (EPA) and science departments in well-established research universities and colleges.

The broad current event topics of climate change and resulting effects on the natural world could serve as the basis for student writing assignments (i.e. essays, poetry, letters to a governmental official, school newspaper articles).

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### Social Studies

1. The physical and economic effects of climate change are evident today and will become a regular topic of global current events reporting in the future. Students can be assigned to geographic regions in the U.S. or the world to investigate what is happening now and predict the future. Special attention should be paid to the effects of a warming planet on species that are important to human societies.
  2. Governmental agencies at the state, regional and national levels (including the U.S. armed forces) are beginning to gear up for the effects of climate change. Students can research these current and proposed regulations and plans and investigate the economic implications for consumers and taxpayers.
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### Math

1. Climate change web pages such as those found at the EPA web site are good examples of how scientists use mathematics to analyze their data and model what they think will be future trends.
2. Students should be required to practice using metric measurements when they need precision. Emphasize the need for a universally-accepted standard of measurement for use in international studies such as those that are carried out around climate change topics.