

CENTRAL QUESTION: What physical features helped a dinosaur survive?

TIME: 50 minutes

OVERVIEW:

- **SECTION 1**
(20 minutes)
Plan and carry out an investigation
- **SECTION 2**
(15 minutes)
Testing explanations
- **SECTION 3**
(15 minutes)
Discuss and reflect

MATERIALS:

- One desktop computer per two students.
- *Student Learning Assessment Tool*
- (Optional) One computer with the ability to broadcast material onto a screen visible by the entire class to facilitate class discussion.
- Additional resources:
 - *Student Learning Assessment Tool*
 - *Student Rubric for Presenting Arguments*
 - *Student Rubric for Assessing Learning Outcomes*

GETTING STARTED

Before class...

- Check your school's computers to ensure they meet the system requirements needed for the Dino Lab game students will use on Step 3 of this investigation:
 - Unity plugin for web-based play--download for free at <https://unity3d.com/webplayer>-- or download the game onto PCs via this link: <http://researchquest.org/cleveland-lloyd/cl-3/step2.php>
 - Google Chrome or Safari Internet browser.
 - Desktop or laptop computers (**Note:** Dino Lab software is not currently compatible with tablets).
- Review this lesson plan, making notes on standards and/or skills you would like to focus on with your students. (**Hint:** Review the documents entitled *Curriculum Alignment* and the *Student Learning Assessment Tool* for ideas on skills and alignments that best support this investigation.)
- Review the following recommended strategies for optimizing student learning outcomes.
 - Working in pairs ensures that every students has the opportunity to share their ideas.
 - Build a shared vocabulary for the learning tasks by identifying target vocabulary beforehand and encouraging students to use these words often. Model correct usage if needed.
 - Think about places you can activate prior knowledge by prompting students to relate new concepts to a familiar context.
 - Think about how to integrate the *Research Quest* investigations with other curriculum-aligned activities.
 - Create and engage student interest in the program by expressing your enthusiasm and/or describing your personal interest in this investigation. You may also want to emphasize that students will be working with authentic materials on research questions that scientists actually address in their work.
 - Introduce students to sentence stems that reinforce flexible thinking and help students verbalize their thought processes:
 - “I see...”
 - “I think...”
 - “I wonder...”

In class...

- Provide a brief overview of the lesson to the class.
- Introduce the objectives the class will be focusing on today.
- Provide each student with a copy of the *Research Assistant Notebook* (RAN).
- Navigate to www.researchquest.org and login using the email address and password you used to create your *Research Quest* account. Then, navigate to the investigations tab.
- Locate this investigation on that page - far right - and click on the orange button with the text that reads, "Student Login Information," located below the name and thumbnail for this investigation. The student URL and your unique student access code will appear on the screen.
- Arrange students into pairs, one pair per computer. Instruct them to navigate to the following URL shown on the "Student Login Information" page, and enter the student access code found on this same page: www.researchquest.org/student/. It is important you have students use this particular URL and access code to get into the investigations. This allows you to keep your administrative account free of student activity.
- Arrange students into pairs, one pair per computer, and instruct them to navigate to the following URL shown on the "Student Login Information" page, and enter the student access code: <http://researchquest.org/student/cldq3>

SECTION 1: PLAN AND CARRY OUT AN INVESTIGATION (20 minutes)

OVERVIEW

In pairs, students will use the Dino Lab simulator to build a unique dinosaur model to survive four different challenges. Students will be prompted along the way to think critically about the relationship between the physical structure and functions of their models and investigate which combinations of features are optimal for success in the game.

ASSESSMENT

In this section, the instructor may find it useful to focus on the following critical thinking skills, defined in more detail in the *Student Learning Assessment Tool* located under the “Teacher Support” tab of the website:

- **Observation:** Make detailed, sense-based observations that discriminate among objects.
- **Interpretations:** Make inferences and interpretations that clearly articulate a link between the evidence and the interpretation.
- **Connections:** Evidence found in one source/object may be used to guide data gathering from other sources.
- **Problem Finding:** Students propose relevant ideas and/or hypotheses and note relevant evidence that could be used to evaluate or inform the idea.

STUDENT ACTION	TIPS FOR SUPPORTING CRITICAL THINKING
STEP 1 Students watch the video on Step 1 of the website (0:36 minutes).	<ul style="list-style-type: none"> ▪ Direct students' attention to the following before beginning the video: <i>Carrie is going to talk about the first task. Listen for what the task is and how to accomplish it.</i>
STEP 2 In pairs, students use the Dino Lab simulation software on Step 2 of the website, while also doing the following: <ul style="list-style-type: none"> ▪ Record their different builds of dinosaur models in their Research Assistant Notebook, pages one through four. ▪ Answer three reflection questions at the end of each challenge. ▪ Develop an explanation for why their dinosaur model was successful or unsuccessful at each stage. <p><i>RESEARCH ASSISTANT NOTEBOOK (RAN): pages 1-4</i></p>	<ul style="list-style-type: none"> ▪ Use the “Student Learning Assessment Tool” to record observations, modeling critical thinking skills as needed. ▪ Draw attention to students/groups that are engaged in target behavior to provide reinforcement and peer modeling. ▪ Prompt students to use sentence stems that reinforce flexible thinking and help students verbalize their thought processes: <ul style="list-style-type: none"> – “I see...” – “I think...” – “I wonder...” ▪ Encourage students to discuss how the structure of their model might affect the physical functions a dinosaur needs in order to survive each challenge. ▪ Note: The discussion questions at the end of each challenge provide the opportunity for students to reflect on their model's performance. Additionally, these questions might provide information that could be used in conjunction with results from testing the models to construct an explanation for why their dinosaur model was successful or unsuccessful.

SECTION 2: TESTING EXPLANATIONS (15 minutes)

OVERVIEW

In pairs, students will test their explanations for which combinations of physical features are most important for their dinosaur model to survive the four different challenges, and continue to gather evidence to support their explanations.

ASSESSMENT

In this section, the instructor may find it useful to focus on the following critical thinking skills, defined in more detail in the *Student Learning Assessment Tool* located under the “Teacher Support” tab of the website:

- **Problem Finding:** Students propose relevant ideas and/or hypotheses and note relevant evidence that could be used to evaluate or inform the idea.
- **Flexible Thinking:** Students remain open to multiple ideas and hypotheses until sufficient evidence is gathered and analyzed.

STUDENT ACTION	TIPS FOR SUPPORTING CRITICAL THINKING
STEP 3 Students prepare and carry out an investigation to test what physical features helped a dinosaur survive, using Dino Lab to test their inferences. RAN: pages 5 & 6	<ul style="list-style-type: none"> ▪ Students can accomplish this step as a class or in their individual pairs. <i>Variation:</i> Students share their explanations with another pair of students and then, in their original pairs, test their peers’ explanations and compare the results to their own results. ▪ Prompt students to test their explanations by building models they predict will be successful or unsuccessful and to record these results as evidence. ▪ Encourage students to discuss how the structure of their model might affect the physical function they are designing for.

SECTION 3: DISCUSS AND REFLECT (15 minutes)

OVERVIEW

Students complete this Research Quest investigation by analyzing and interpreting what they have learned and using the evidence they’ve gathered to construct an explanation for what physical features helped their dinosaur models survive.

ASSESSMENT

In this section, the instructor may find it useful to focus on the following critical thinking skills, defined in more detail in the *Student Learning Assessment Tool* located under the “Teacher Support” tab of the website:

- **Problem Finding:** Students propose relevant ideas and/or hypotheses and note relevant evidence that could be used to evaluate or inform the idea.
- **Evaluations:** Students use multiple forms of evidence and/or evaluate the strength of their evidence when evaluating an idea or hypothesis.

SECTION 3: DISCUSS AND REFLECT (Continued)

STUDENT ACTION

TIPS FOR SUPPORTING CRITICAL THINKING

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| STEP 4 In pairs, students discuss what they have learned and then fill out the form on Step 3 of the website to share their explanations and supporting evidence with Carrie. | <ul style="list-style-type: none">Note: This step is optional. However, responses from all students using your unique student access code will show up in your admin dashboard on the <i>Research Quest</i> website. |
| STEP 5 Students may complete additional extension activities. | <ul style="list-style-type: none">Optional extension activities are provided on the website to take student learning a step further.The <i>Student Rubric for Assessing Learning Outcomes</i> is located in the support materials for each investigation. Using this rubric, students can reflect on the critical thinking skills that they developed and practiced during this investigation, and think about ways they can continue to use these skills in the future.Reinforce critical thinking skills, vocabulary, and other target behavior during curriculum-aligned activities. |