Clash of the Titans

Combining WebQuests and the 5E learning cycle in an exploration of predator–prey relationships and nonnative species taps into the potential of both strategies.

By Karthigeyan Subramaniam

WebQuests and the 5E learning cycle are titans of the science classroom. These popular inquiry-based strategies are most often used as separate entities, but I discovered using a combined WebQuest and 5E learning cycle format taps into the inherent power and potential of both strategies. In the lesson, “Clash of the Titans,” there are two other titans involved—titans of the animal world—alligators and pythons. Through this combined WebQuest/5E lesson, students learn about predator–prey relationships and human effects on the environment through introduced species.

Often, when teaching the topic adaptations of organisms, my sixth-grade students assume that learning about predator–prey relationships is only dependent on the type of predator and prey animals. They do not take into account the characteristics of animals or the human interactions with the environment that affect the animals’ abilities to survive or compete with other animals in that environment. This article presents a lesson to help students understand how those factors affect the survival of animals.

Although I had successfully used WebQuests and the 5E learning cycle as separate strategies to teach this topic in previous lessons, my first attempt at combining the two stra-
egies enabled me to integrate the inquiry emphasis of the 5E learning cycle with the content emphasis of WebQuests.

A Natural Pairing

The 5E learning cycle (Engage, Explore, Explain, Elaborate, and Evaluate) supports inquiry learning by focusing on real phenomena through teacher- or student-designed investigations (Bybee 1997). Each of the five stages of the learning cycle develop students’ competence in scientific inquiry by acknowledging students’ prior knowledge, curiosity, and real-life experiences and providing a range of activities (in laboratory or nonlaboratory settings). WebQuests are learning structures (Introduction, Task, Process, Resources, and Evaluation) that use internet resources to provide content and conceptual frameworks for student- or teacher-designed investigations of real-life phenomena (March 2003/2004). These conceptual frameworks support students’ investigations of real-life phenomena.

The learning power and potential of these two learning activities are usually gained separately. One of the weaknesses of using a WebQuest is the time invested in developing one (Halat 2008). If you are already using the 5E learning cycle and are keen to add an educational technology element, this strategy provides an easy-to-follow template.
Introduction = Engage

Start off the lesson by activating students’ curiosity with the “snake bursts after gobbling gator” visual on a PowerPoint slide or by showing the website that contains the visual (see Internet Resources). Give students time to observe and draw the visual and list the questions they have about the visual. Drawing provides students instruments for reflecting and communicating their ideas.

Have students think-pair-share their drawings, questions, and answers. Get them to reflect on their drawings by thinking for a minute or two, and then ask them to choose a partner and share their thoughts with their partners. Also ask students to share the questions they have listed about the visual with their partners and then construct answers to their listed questions. After students have completed their drawings and listed their questions, have them (a) describe the characters in the visual or (b) create a story for what had happened.

Students’ stories usually have plots or titles like, “Tummy ache mishaps,” “Watch what you eat,” and “Way too much food dude!” Students’ explanations accompanying these common story plots involve descriptions of the python (the predator) capturing or attacking the alligator (the prey). However, they do not understand that the alligator is a top predator in the specific environment (Everglades National Park) and that the Burmese python is an alien species to that environment—one that is successfully adapting behaviorally and reproductively to its new environment.

Follow up by reading the short article that accompanies the visual, or have students read the article. Either way, make sure students record keywords: predators, alligator, Burmese python, Everglades National Park, nonnative, food chain, leading position, encounters, and species. Focus students onto the two main characters, the Burmese python and the alligator, by asking students what they know about each of them. Using the visual and students’ own drawings or stories, get students to craft a driving question and a set of associated questions in relation to what is depicted in the visual. A driving question incorporates science content and real-life context and is crafted to include a nonlaboratory or laboratory investigation. If students have trouble generating a good driving question on their own, I present possible questions from which students will select one to investigate. For this lesson, the question, “How did the Burmese python become a predator in the Everglades National Park?” is a popular driving question that students like to investigate. I also include a set of associated questions, for example:

- Why did the Burmese python and the alligator meet?
- What happened to the Burmese python and the alligator?
- Was there a brawl between the Burmese python and the alligator? Why did they both lose the brawl?

Developing questions enables students to identify a significant driving question for investigation in the next phase of the combined strategy.

Task + Resources = Explore

In this phase of the lesson, students carry out their research to find answers to the driving question, “How did the Burmese python become a predator in the Everglades National Park?” (along with other associated

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### Figure 1.

**Table of findings (summarized).**

<table>
<thead>
<tr>
<th>Burmese Python</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification</td>
<td>Family of Snakes</td>
</tr>
<tr>
<td>Range</td>
<td>Native to South Asia</td>
</tr>
<tr>
<td>Habitat</td>
<td>Lives in wet environments</td>
</tr>
<tr>
<td>Physical Attributes: Adult Body Length</td>
<td>3.7 m</td>
</tr>
<tr>
<td>Physical Attributes: Adult Body Weight</td>
<td>32–55 kg</td>
</tr>
<tr>
<td>Diet</td>
<td>Small mammals and birds</td>
</tr>
<tr>
<td>Life Style</td>
<td>Predator</td>
</tr>
</tbody>
</table>

**Our Summary**

Based on our research we have discovered that the Burmese python is not native to the Everglades.
questions) by using websites compiled by the teacher (see Internet Resources).

Working in groups, students research each question and communicate their findings on the Burmese python and the alligator. Details that students are required to find out include classification, range, habitat, physical attributes (length, weight) life span, diet, reproduction, and life cycle.

Students are asked to record their information in tables and summarize their findings (Figure 1). The tables serve as graphic organizers to motivate students to construct their own findings from the website resources. These artifacts are used as formative assessment tools to observe and account for students’ progress in their inquiries.

Student groups then collaborate to create PowerPoint presentations. Students transfer their tabulated findings on both the Burmese python and the alligator onto PowerPoint slides (Figure 2). By using the “two content, comparison with captions” layout, students are prevented from cutting and pasting all the information they find because they have to make informed decisions that will help them construct solutions to their inquiries that fit into the predetermined layout. Moreover, presenting findings using the layout options of PowerPoint slides enable students to communicate and share their findings effectively to multiple audiences. Another advantage is that students’ PowerPoint slides are easily printed out for grading and can be converted to internet pages.

**Process = Explain**

Explaining and illustrating the outcomes of the previous phase, task/explore, is a major component of the process/explain phase. Using their PowerPoint presentations, students present their findings in response to the driving question by comparing and contrasting details about the Burmese python and the alligator, or their life cycles, or the food chains that the Burmese python and the alligator belong to (Figure 2). At this point, I assess students’ presentations using a rubric (Figure 3, p. 42), specifically looking out for how my students use details on their slides to discuss answers in relation to the driving question. Using the information in the presentations, students construct explanations to their questions about the “snake bursts after gobbling gator” visual.

Typical student explanations usually include descriptions of both the Burmese python and alligator as top predators that share similarities in life-cycle stages, habitats, and diets. Students also tend to realize that the Burmese python is a nonnative species to the Everglades National Park, but that the park’s similarities to its native habitat—the wet environment and availability of small mammals and birds—allows it to live in this environment.
In addition, a typical question that students have at this point is how the Burmese python got to the Everglades National Park. After the presentations, engage students in a teacher-led discussion of the following questions:

- How is the Burmese python’s behavior evolving through adjusting to its new environment, the Everglades National Park? (Burmese pythons have adapted well to the wetlands and hot climate of the Everglades National Park and thus are challenging alligators’ leading position as the top predator.)

- What are the environmental factors that support the reproduction, regulation, and behavior of the Burmese python and the alligator? (The wetlands and hot climate of the Everglades National Park support the reproduction, regulation, and behavior of the Burmese python and the alligator.)

- What are the adaptive characteristics of the Burmese python and the alligator that allow them to survive in the Everglades National Park? (Their predatory lifestyle and their diet of small mammals and birds that inhabit the Everglades National Park allow them to survive.)

These discussions provide connections to constructing concepts about predator–prey relationships and human interactions with the environment. For example, predator–prey relationships involving the Burmese python and the alligator can be linked to the commonalities in their predatory lifestyles and diets. In addition, the presence of the Burmese python can be connected to the human activity of abandoning nonnative and exotic pets, like the Burmese python, into the Everglades National Park.

A key explanation that connects to the learning goals of this lesson is the need to emphasize that even though each species lives in a specific environment, like the alligator in the Everglades National Park and the Burmese python in the wetlands of Southeast Asia, species like the Burmese pythons can acquire characteristics through biological or...
behavioral adaptations that enhance their chances of survival in new environments. This adaptation might result in competition between species for food and shelter and the chances for some species to become extinct because of the competition.

Elaborate

Although there is no corresponding elaboration phase in WebQuest, the elaboration phase of the 5E learning cycle provides opportunities for students to expand their understanding of learning outcomes and extends the WebQuest. In this elaboration phase, I incorporate web-based media resources that contain newscasts about the “snake bursts after gobbling gator” incident (see Internet Resources). I have students compare and contrast their finding with those of the media, highlighting the similarities or differences or any details they might have overlooked in the explore phase or the explain phase of the lesson.

One key finding that students describe is how human interactions with the environment—like the introduction of the Burmese python to the Everglades National Park—changes the already existing predator–prey relationships, resulting in adverse changes to animal populations and habitats. In addition, they also find out that alleviating these problems requires knowledge and research on the adaptations of the nonnative and native species.

Evaluate

In this lesson, formative assessment of students’ learning is emphasized at each of the engage, explore, explain, and elaborate phases. For example, students’ own drawings or their stories, driving questions, PowerPoint slides, presentations, and participation in discussions serve as assessments to account for students’ development of concepts throughout the lesson. The rubric (Figure 3) can be used to formatively assess students during each phase and then provide a summative assessment of students’ learning outcomes.

A Winning Combination

In addition to being an engaging exploration of predator–prey relationships and adaptations, this combined lesson effectively incorporates technology. In fact, students need to employ creativity and innovation, research and information fluency, critical thinking, problem solving and decision making, and technology operations and concepts (four of the six National Educational Technology Standards and Performance Indicators for students; ISTE 2007) in their investigations.

This combined WebQuest/5E lesson provides students with skills like planning, managing, locating, collecting, analyzing, evaluating, and synthesizing pertinent information and provides teachers with time constraints with an easy way to combine both strategies. This lose–lose case for the python and alligator is a win–win for teachers and students.

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References


Internet Resources

American Alligators—Alligator mississippiensis
  www.tigerhomes.org/animal/curriculums/american-alligator.cfm

Animal Fact Sheets: Indian Python
  www.zoo.org/animal-facts/indianpython

Snake bursts after gobbling gator
  http://news.bbc.co.uk/2/hi/americas/4313978.stm

Connecting to the Standards

This article relates to the following National Science Education Standards (NRC 1996):

Content Standards

Grades K–4

Standard A: Science as Inquiry
  • Abilities necessary to do scientific inquiry

Standard C: Life Science
  • Characteristics of organisms
  • Life cycles of organisms
  • Organisms and their environment

Grades 5–8

Standard C: Life Science
  • Structure and function in living systems
  • Reproduction, regulation, and behavior
  • Populations and ecosystems
  • Diversity and adaptations of organisms