

Living the Life in Antarctica

To begin the process of educating my students on my upcoming expedition to Antarctica, I introduced an activity entitled, "Questions about Antarctica...It's What's for Dinner." In this assignment, small groups were asked to develop a list of 10 questions about anything - weather, clothing, wildlife, geography, geology, oceanography - related to Antarctica. Each question was worth up to 10 points and had to be developed according to the six critical thinking levels of Bloom's Taxonomy. Each student group could choose from any level to base their question, but the lower the level, the lower the point value.

Conversely, the higher the level of question, the higher the point value with a question created from the highest level of critical thinking. Creative, would warrant the group the maximum value of 10 points for that question.

The extension of this lesson to the capstone project of this activity came about as I then assigned each group the task of developing a hands-on project deliverable that would assist them in answering one or more of their questions. I gave my students free reign on their ideas, strategies, materials, and technology used to develop their project. Several examples of project outcomes in my experience included a 3D print of the Antarctica landscape, a mathematical/ graphical analysis of Antarctic weather data taken over a preselected time frame, development of clothing for extreme weather conditions for two doll-like figures who reside in Antarctica, and the development of an activity in which students wore Extreme Cold Weather gear (on loan from PolarTREC) and competed in activities representative of life in Antarctica.

Objectives

Students will:

Details

- Lesson
- Antarctic
- More than a week
- Download, Share, and Remix
- High school and Up

Materials

Computer/Laptop with access to Internet
Tech tools/apps
Materials specific to student group's planned project

Standards

Next Generation Science Standards (NGSS)

Physical Science:

Energy: HS-PS3-1, HS-PS3-4
Waves and their Applications in Technologies for Information Transfer: HS-PS4-5

Life Science

Ecosystems: Interactions, Energy, and Dynamics: HS-LS2-1, HS-LS2-2, HS-LS2-4, HS-

- Learn about the development of questions according to critical thinking levels
- Collaborate in a small-group environment and learn how to delegate responsibilities and collectively agree on a topic that is suited to the talents, abilities and interests of the group members.
- Learn about an aspect of Antarctica by engaging in a hands-on project with a deliverable of their choice.
- Conduct their research and develop their project in response to a question they developed according to a time line, providing daily and weekly progress reports/updates to their teacher according to a previously presented timeline.

LS2-7, HS-LS2-8
 Biological Evolution: Unity and Diversity HS-LS4-5

Earth and Space Science

Earth's Systems: HS-ESS2-4
 Earth and Human Activity: HS-ESS3-5, HS-ESS3-6

Lesson Preparation

The first step in preparation should be an in-depth review toward the development of a knowledge base of the biological, geological and geographical, and meteorological aspects of Antarctica. The teacher should be prepared to respond to a spectrum of potential questions that will stoke the interest of students and help guide them toward an appropriate project that would maximize their interest and talents.

The second step in preparation should be possession of or have easy access to an adequate supply of materials and resources that might be incorporated into projects. One of the great things about this project is the freedom for student groups to choose the direction and level of creativity toward the completion of their project. One of the worst things about this project is the freedom for student groups to choose the direction and level of creativity toward the completion of their project.

The third and final level of preparation would be:

- (1) To develop a constant and consistent presence checking on the progress of each group,
- (2) to troubleshoot problems seen and unforeseen,
- (3) to mediate unplanned disagreements often characteristic in group-based instructional initiatives, and
- (4) to offer constructive criticism and suggest proposed pathways toward a solution, when needed.

Procedure

Step 1: The teacher should first begin with the lesson described as my Phase 2 activity: "Questions about Antarctica...It's What's for Dinner". This is a group project so the teacher can allow the students to select their own group members or the teacher can randomly select groups for this lesson. The teacher should go over the various levels of critical thinking skills and the development of questions that align with each level.

Step 2: The teacher introduces the students to Antarctica through a variety of resource materials utilizing various types of media. I would suggest using videos such as those produced by National Geographic to provide the students with a visual display of Antarctica. In addition, the

teacher could also provide articles from National Geographic as reading assignment in class or for homework. This should provide them with a basic framework by which to continue researching Antarctica and to start developing questions.

Step 3: Once the Questions about Antarctica assignment is complete, the teacher then introduces the project (Living the Life in Antarctica), goes over the parameters and expectations of the project, describes the grading rubric and facilitates the selection of groups.

Step 4: The teacher should designate a day within the first week of introducing this lesson for each group to identify their question that they choose to incorporate into their project deliverable and invite them to begin working.

Step 5: The teacher gives the students freedom to choose the question they will respond to as well as their idea for the project, ensuring that the students have all of the necessary tools, materials and equipment and access to technology they will need to complete their project. In addition, the teacher should make sure that their project is not overly ambitious and can be done within the project timeframe.

Step 6: The teacher conducts daily and weekly progress assessments with each group, ensuring that each group is moving steadily toward the deadline and that if any problems arise, the teacher can step in to troubleshoot or offer hints/suggestions on how to proceed with the tasks at hand.

Step 7: On the day that the assignments are due, the teacher has each group present their project by first stating the question that they chose as a basis for their project, their idea on a solution for their project and then present their deliverable to the class.

Extensions

- To encourage intragroup interactions and discussions by having all groups display their product in a museum-type format where each group would develop an exhibit of their project with a poster highlighting all of the important information about their topic, their process and their product. Then members of each group could circulate about the exhibits, asking questions and gaining information that they in turn take back to their other group members and share.
- The teacher might also want to post the products from this project on a school webpage or on a newsletter-type app like S'more or Nearpod that can be shared with other teachers and, most importantly, parents.
- I would also like to take this opportunity to document possible modifications of this lesson to students of different grade levels and learning abilities. Although this lesson was used with my students who are high school physics students, this project can be adapted to any grade level, keeping in mind that the level of questions expected from the majority of groups might be more elementary in nature.
- The one modification that I would like to propose and try to implement in subsequent years would be for English Language Learners. This is an excellent activity for these students to learn vocabulary as well as apply their newly acquired knowledge toward their understanding of Antarctica. This would require attention, support, and resources by the

English Department of from specialists at the District who are experienced in teaching strategies geared toward English Language Learners.

Resources

The outside materials listed below were used to help educate the students about Antarctica and many of the geographical and scientific features about the seventh continent. As the students began to formulate an idea and plan for their specific project, they consulted additional resources unique to their proposed project idea.

PolarTREC – www.polartrec.com

United States Antarctic Program – www.usap.gov

Cool Antarctica – <https://coolantarctica.com/>

Antarctica New Zealand – <http://www.antarcticanz.govt.nz/>

Ballesta, L. Deepest Dive Ever Under Antarctica Reveals a Shockingly Vibrant World; July 2017. <https://www.nationalgeographic.com/magazine/2017/07/under-antarctica-fro...>

Welch, C. Get an Amazing Whale's-Eye View Underneath Antarctica; April 2017. <https://news.nationalgeographic.com/2017/04/humpback-whale-pov-video-ant...>

Assessment

The assessment of this lesson will occur according to three driving criteria:

- (1) the level of question chosen by the group as the source of their hands-on project;
- (2) the detailed and creative nature that was invested in the development of the project;
- (3) the collaborative effort and group involvement in meeting deadlines and having a completed project on the designated deadline.

The weighted points assigned to each aspect of this assessment would depend on the teacher, availability of technology, materials and resources, as well as the capabilities of the students. However, the teacher should emphasize that the final grade is dependent upon the challenging level of question chosen as a source for the project deliverable and the effort/creativity invested in the project. Because this is a six-weeks project, there should be ample time available to the students to develop an educational masterpiece.

Author/Credits

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