Everest Education Expedition Curriculum

Lesson 1: Who's on Top?

Created by Montana State University Extended University
and Montana NSF EPSCoR
http://www.montana.edu/everest

Lesson Overview:

Meet world famous climber Conrad Anker of Bozeman, Montana; Montana State University Geology Professor Dr. Dave Lageson; MSU geology student Travis Corthouts and the rest of the Everest Education Expedition team. Begin your journey of learning and exploration with Conrad and Dave, leaving their homes in Bozeman, Montana to climb the highest mountain in the world. Uncover the goals of the Everest Education Expedition and feel what it might be like to climb Mount Everest at extreme altitudes.

Objectives:

Students will be able to:

1. Describe the Everest Education Expedition's scientific mission, as well as the tools and equipment the team used.
2. Simulate and analyze what it might be like to climb Mount Everest in terms of equipment and physiology.

Vocabulary:

acclimatization: the process of adjusting to a new environment including altitude
altitude: the height of place measured from sea level
altitude sickness: a condition affecting some persons at high altitudes, caused by insufficient oxygen in the blood and characterized by dizziness, nausea, and shortness of breath
ascend/ascent: to climb upward
base camp: a place used to store supplies and get ready for climbing located low on the mountain, safe from harsh weather, icefalls, avalanches and the effects of high altitude found higher on the mountain
crampons: ice cleats that help climbers walk up and on ice and snow
elevation: the height of place measured from sea level
GPS: Global Positioning System; a small handheld device that shows where you are on the Earth's surface using satellites.
HACE (high altitude cerebral edema): a life-threatening swelling of the brain that occurs in otherwise healthy mountaineers at high altitudes
HAPE (high altitude pulmonary edema): a life-threatening accumulation of fluid in the lungs that occurs in otherwise healthy mountaineers at high altitudes
ice axe: a tool used for climbing ice
massif: a compact group of connected mountains forming an independent portion of a range
summit: the highest point of a mountain; to reach the highest point of a mountain

Background Information:
In spring 2012, a team of world class climbers led by mountaineer and author Conrad Anker embarked upon a historic expedition to commemorate the 50th anniversary of the first successful American ascent of Mount Everest. In 1963, two Americans (Tom Hornbein and Willi Unsoeld) became the first to successfully climb Everest's West Ridge then descend via the Southeast Ridge, thus traversing the entire mountain. This was one of the most difficult high-altitude feats in mountaineering history. Several members of the team climbed the Southeast ridge to honor this achievement.

The climbers used the Southeast Ridge route, climbed by other Americans on the 1963 team. They conducted extensive scientific work on the mountain and will share the science of the Himalayas with students and the public.

Because the Everest Education Expedition was tied to Montana State University and supported by Montana EPSCoR — special emphasis was placed on bringing the excitement of science, discovery, and global adventure into classrooms across Montana and the nation.

Scientific Research Mission of the Everest Education Expedition
Scientific research on the geology of Mount Everest will be a significant component of the Everest Education Expedition, as it was with the first American expedition to Everest in 1963. Previous research in the Everest region is limited in scope due to the obvious difficulties of conducting field work under extreme conditions of elevation and topography.
The research was directed towards:

- Gaining a better idea of the age of Mount Everest and rocks that comprise the **massif** (the compact and connected group of mountains around Mount Everest that includes Everest, Nuptse, Lhotse, and Khumbutse);
- Collecting a suite of samples to better date and describe the fossil-bearing marine limestones that form the summit pyramid of Everest;
- Studying the major faults that cut through Mount Everest to better understand how and when they formed (in particular, the Qomolangma and Lhotse detachment faults);
- Measuring a new GPS-based elevation of the summit of Mount Everest with the most modern and accurate equipment available.

(To learn more about the scientific mission of the Everest Education Expedition visit http://www.montana.edu/everest/about/research.htm.)

Activity 1: What We Know

Length: 10 minutes

Materials:

- *Pocket folder for all Everest Education Expedition working documents (optional)*
- *Chart paper*
- *Markers*
- *Map of world / atlas / globe*

1. Tell your student that over the next several weeks, they will be shadowing an expedition to Mount Everest to learn more about the history, geography, geology and culture of this mountain. This is an exciting way to be a part of an historic expedition commemorating the 50th anniversary of the first successful American ascent of Mount Everest. Explain to your students that before starting this study, you are going to explore what they already know about Mount Everest.
2. Make a KWL chart with your students. Label the top of three different pieces of chart paper with the following titles: "What I Know About Mount Everest", "What I Want To Know About Mount Everest", and "What We Learned About Mount Everest". (Using chart paper will allow you to refer back to this chart over the next few weeks.) Have your students brainstorm as a class what they know (or 'think they know') and want to know about Mount Everest. Record all student responses on the first two correlating charts. Save them to refer back to throughout and at the end of the unit.

Activity 2: Meet the Team!

Activity Length: 15 minutes

Materials:

- Computer/s with Internet access

1. Explain to your class that during this study, they will be retracing the steps of world famous climber Conrad Anker of Bozeman, Montana; Montana State University Geology Professor Dr. Dave Lageson, MSU student Travis Corthouts (pronounced Corth-outs) and the rest of the Everest Education Expedition team during their attempt to **summit** (or climb to the top of) Mount Everest.
2. Tell your students that one of the climbers is world-famous adventurer, Conrad Anker, who they will "meet" by watching a video and listening to interesting facts about him.
    a. With your students, watch a short video of Conrad. This video is available at http://www.montana.edu/everest/multimedia or on YouTube at http://youtu.be/sap5XOi_iZg You can read a transcript at the end of this lesson.
    b. After the video, you can share with you students some more information about Conrad. Prior to the 2012 EEE, he had summited Everest twice and this is what he thinks a person needs to successfully climb Mount Everest or other difficult peaks. Ask your students if they think they have these characteristics.
        • Confidence
        • Mental determination

- High pain threshold
- Ability to deal with drastic temperature changes

c. Climbing Mount Everest is incredibly difficult and Conrad has a few good luck rituals that he always follows when he's on a dangerous expedition. He always carries a photo of his family, puts his left shoe on first, and brings a brand new pair of socks to wear on the day he attempts to summit a mountain. Ask your class if they have any good luck rituals. Why do they think people have good luck superstitions?

3. Introduce your students to another climber who was a part of the expedition, Dr. David Lageson. Watch a short video of Dave introducing the Everest Education Expedition and the mission of the historic adventure. This video is available at http://www.montana.edu/everest/multimedia or on YouTube at http://youtu.be/8QavYlZgrF4 The transcript is at the end of this lesson.

4. Your students can also meet Travis Corthouts, the MSU graduate student who was on the Expedition. Watch a short video of Dave introducing Travis. This video is available at http://www.montana.edu/everest/multimedia or on YouTube at http://youtu.be/du-ZC3NyaZs The transcript is at the end of this lesson.

5. Briefly share with your students the names of the other climbers who were a part of the Everest Education Expedition team. Each climber's full biography and photograph can be found at http://www.montana.edu/everest/about/index.htm

a. Cory Richards - One of National Geographic's Adventures of the Year for 2012
b. Sam Elias - Climber and skier from Colorado
c. Kristoffer Erickson - Climber, skier and photographer; Montana State University graduate.
d. Emily Harrington - Female Climber of the Year at the Teva Mountain Games and attended the Winter Olympic Games in Torino, Italy as a US climbing ambassador.
e. Phil Henderson - Utah River Based Manager at the National Outdoor Leadership School.
f. Mark Jenkins - Field staff writer for *National Geographic* magazine and the Writer-in-Residence at the University of Wyoming
g. Hilaree O'Neill - Named by *Outside* magazine as one of the most adventurous women in the world of sports. She is also the mother of two small children.
h. After these videos and short introductions, see what questions students would have for the Team. Encourage scientific questions based on the Team's mission.

Activity 3: Walking in Climber's Boots

Lesson Length: 20 minutes

Materials:

- *Chart pad*
- *Markers*
- *Mount Everest Expedition Equipment List*
  http://www.montana.edu/everest/resources/other/Everest_Expedition_Equipment_List.pdf
- *Pocket folder for all Everest Education Expedition working documents (optional)*
- *Calculator*
- *Scale (optional)*
- *Drinking straws-one for each student*
- *Stopwatch or timer (one for each group of 4 students)*
- *Backpack*
- *Five heavy textbooks*

Teacher Prep Notes: Pre-test the simulation experiment on your own (Step 3 in activity below) before conducting it with your students. Students will need to walk up and down stairs for 30-second intervals or have the space to walk at a quick pace for 30 seconds somewhere safe on your school campus.

1. Brainstorm with students all the clothes they have on. Ask them how much they think everything they are wearing weighs. Allow students to guess, and then tell your students that the clothing they are wearing weighs approximately 2-3 pounds.
2. Ask your students if they can name another unit used to describe weight. Introduce (or remind) your students of the unit kilograms. Discuss with your students that kilograms are part of the metric system of measurement used by nearly every country but the United States. In the United States, the metric system, including kilograms and kilometers is used in science and by the military. The Everest Education Expedition team used metric measurements because it is the standard international system.
3. Have your students individually convert the weight of their clothing into kilograms by dividing 2 pounds by 2.2 (to equal 0.9 or about 1 kilogram). Share the correct answer with your students and correct errors.
4. Now, ask your students how much they think their backpack weighs with a typical day's supplies in it (binders, textbooks, lunch, etc.). Allow students to guess, and then tell your students that a typical 5th grader's backpack weighs between 4 and 6 pounds. Again, have your students convert this into kilograms (1.8 to 2.7 kilograms).
5. Read your students the Equipment List (available at the end of this lesson) for a typical Mount Everest climber. (Vocabulary included in this reading includes **crampons**, **ice axe**, and **GPS**.) Tell them that climbers carry most of the items on the list in a backpack. Ask the students how much they think a backpack will weigh for a Mount Everest climber. Take several responses before telling students that climbers carry an average of 40 pounds of supplies while hiking *above* Mount Everest's **Base Camp**. (Base Camp is a place used to store supplies and get ready for climbing located low on the mountain, safe from harsh weather, icefalls, avalanches and the effects of high altitude found

higher on the mountain.) Have your students convert this to 18.14 kilograms. The average Mount Everest climber probably weights around 170 lbs (77.11 kg) so they are carrying approximately ¼ of their weight on their backs. Climbers' carry light backpacks that are around 20 lbs. (9.07 kg) when they are hiking to Base Camp and yaks carry the rest. At **elevations** above 17,000 feet (5182 m), the height of a place measured from sea level, it is extremely difficult to carry heavy packs due to the lack of oxygen in the air.

6. Explain to students that to simulate what it is like to climb Mount Everest at extreme altitudes with the gear they would need, they are going to conduct an experiment using their loaded backpacks, straws and a set of stairs. (If you do not have access to stairs, have students walk at a quick pace for one minute through the halls, around the school playground or another safe area.) Explain the following steps of the experiment to the students. Divide your class into small groups of four students each and lead students through each step.
    - **a.** Pass out materials for each group of four students: one backpack with five large textbooks (approximately 10 pounds or 4.5 kilograms), one timer or stop watch, and four drinking straws (one per student).
    - **b.** Have your students take turns in their groups wearing the backpack with textbooks while climbing up and down the stairs for 30 seconds. One student from each small group will climb the stairs at a time.
    - **c.** Then, have students take turns in their small groups climbing up and down the stairs wearing the backpack with textbooks while breathing through a straw to simulate constricted availability of oxygen.
    - **d.** Lead a discussion with your students about what they experienced. Ask your students:
        - **i.** Did the added weight of the backpack make climbing the stairs difficult?
        - **ii.** Were you out of breath after climbing the stairs with the backpack?
        - **iii.** What was it like breathing through the straw while climbing the stairs with the backpack?
        - **iv.** Did you rest or take a break during the timing?
        - **v.** Do you think climbers on Mount Everest have to take breaks while climbing?
        - **vi.** Ask each student how much he or she weighs (or weigh them if you have a scale). Ask them to calculate how heavy their backpack would be if it was equal to ¼ of their body weight. How much more weight would they have to add to the 10 lb backpack to get it to be ¼ of their weight?

Activity 4: The Death Zone

Lesson Length: 10 minutes

Materials:

- *MSU Science Zone #30 "Can humans survive at high altitude" worksheet (one per student) http://eu.montana.edu/pdf/outreach/msuscizone30.pdf*

1. Tell your students that altitude is very difficult on climbers. Just like it was difficult to breathe out of a straw, it is difficult for climbers to get enough oxygen to live. Explain to your students that most climbers that summit Mount Everest use supplemental oxygen. Two members of this expedition will be climbing without any oxygen - Cory Richards (on the West Ridge) and Mark Jenkins (on the Southeast Ridge route).
2. Have your students read the MSU Science Zone sheet. (Vocabulary included in this reading includes **altitude, altitude sickness**, **acclimatization**, **HAPE**, and **ascend**.)
3. Have your students answer the questions on the worksheet and review the answers as a class.

NOTE: The "Try This!" section of this worksheet may be assigned as a take-home activity or you can extend this lesson by using this activity in class.

Tying it All Together:

Use the following ongoing activities to reinforce each lesson's concepts, tie lessons together, and make the lesson relate to your hometown. Grade for completion, management of data collection, effort and participation throughout unit.

1. **"Mount Everest and Me" Worksheet**
   http://www.montana.edu/everest/resources/worksheets/Worksheet_EverestandMe.pdf

   This worksheet will be an ongoing activity for your students. In a table format, the "Mount Everest and Me" Worksheet compares Mount Everest, Granite Peak (the highest peak in Montana), and your hometown. Using comparisons, the worksheet reinforces the lesson's content while helping students put this knowledge into perspective by comparing their home state and hometown. Have your students fill in the correlating rows of the table after completing each lesson. This can be completed as a class or individually.
2. **Everest Education Expedition Vocabulary Crossword Puzzle**
   http://www.montana.edu/everest/resources/worksheets/Worksheet_Lesson1Crossword.pdf

   This crossword puzzle reinforces vocabulary presented in each lesson. Have your students fill in the correlating vocabulary words for each lesson's puzzle after each lesson.

Taking it Further:

Conrad's Training Regime

Share with your students how Conrad Anker trained for climbing Mount Everest.

1. He maintains a high level of physical activity and never lets himself get out of shape.
2. He gets aerobic exercise every day for at least a half hour or more.
3. He does weight training.
4. He does push-ups and sit-ups.
5. He fits exercise into his day whenever he can. For example, he walks or bikes instead of taking a car. He takes the stairs, not an elevator or escalator.
6. He does micro-workouts. If he is ever stuck in an airport, he'll go to a place where no one can see him and will do a small workout.
7. He is mindful of what he eats. He avoids unhealthy ingredients such as trans fat.
8. He does hand strengthening exercises. He carries around a hand exercise tool to work on his grip when he has some down time.
9. He does lots of stretching.
10. He gets his body used to being cold through activities like climbing without gloves or jogging with snowballs in his hands.
11. He visualizes possible worst-case scenarios that could happen on a climb. He imagines what kind of challenges he will face and mentally prepares himself for what will be hard. Staying healthy and safe is about risk management and being prepared.
12. To prepare his body for expeditions, he often fasts for a full 24 hours about once a month so he is used to having very little food.

Ask your students what they would need to change in their daily routine to train for climbing Mount Everest if they were going to climb Mount Everest. Ask your students what part of the training would be the hardest or what parts they would not enjoy. Conclude this discussion by emphasizing the difficulty of climbing Mount Everest and the dedication it takes to prepare for the climb.

Walking the Walk:

Have your students use a map with a scale to calculate how far it is from Base Camp to the summit of Mount Everest and convert it into miles. Convert this measurement into something relevant to students. Have your students imagine what walking this distance would feel like while breathing through a straw and carrying a backpack. Have your students write about what it would be like to climb Mount Everest.

Go Through the Dispatches:

Read one chapter per week.

Video Transcripts:

Conrad Anker transcript

http://youtu.be/sap5XOi_iZg

Hello. I'm Conrad Anker, leader of the 2012 Everest Education Expedition.

Come join us as we learn more about the physical world.

We'll go from base camp to the summit of our planet's highest mountain. We'll learn all sorts of great things, like how are there marine sediments on top of Mount Everest, how fast do glaciers move, and how does the human body react to high altitude.

This and many other things are yours to learn at montana.edu/Everest.

Dave Lageson transcript

http://youtu.be/8QavYlZgrF4

Hi. My name is Dave Lageson. I'm a geology professor at Montana State University in Bozeman, and I'm a member of the 2012 Everest Education Expedition.

We're going to be going to Kathmandu and then trekking into the base of Mount Everest, doing a lot of geological research, and trying to get a better understanding of the history and origin of Mount Everest.

Be sure and follow along the Expedition on our website, which is www.montana.edu/everest.

Be looking for updates and videos and various things that we're going to post to that website throughout the expedition.

I hope you enjoy the experience as much as we will!

Dave Lageson introduces Travis Corthouts

http://youtu.be/du-ZC3NyaZs

Hi. I'm Dave Lageson. I'm a geology professor at Montana State University, and I'm a member of the 2012 Everest Education Expedition.

We're really looking forward to learning some new things about the geology of Mount Everest and exploring the fantastic history of this region through the eyes of a geologist.

I'm going to be working with my new graduate student, Travis. He's a graduate of Montana State University and he's a new graduate student in our department. His master's thesis will be based on the geology of Mount Everest.

Hey, everyone. I'm looking forward to sharing the awesome geology of the Everest region.

I hope you enjoy it.