Save the Penguins

Memphis Zoo

This activity has been adapted from: <http://www.auburn.edu/~cgs0013/ETK/SaveThePenguinsETK.pdf>

I have shortened the lesson quite a bit. Check out the site above for an   
additional activities and materials.

Divide participants into teams of three to four.

(Using a PowerPoint presentation, I will show photos of the warm-weather, African black-footed penguins that currently make their home at Penguin Rock in the Memphis Zoo. I will tell a story of a benefactor who wants to donate an additional species—the Emperor penguin, a species who makes their home in the Antarctic—and build the zoo a new penguin habitat to house them. But, they cannot survive the Memphis heat!)

When you are helping participants test their finished designs, remember to:

* Zero out the gram scale with the small shallow plastic cup on it.
* Use the tongs to hold the ice cube.
* Have each group place their enclosure in one of the squares formed by the grid on the bottom of the testing chamber (so all the enclosures will fit).
* Make sure all groups have at least begun testing at the 18-minute mark (the time constraint for designing and creating their enclosures).

After testing, have groups share out their designs and specific design features. Ask each group:

* **What was your percentage of loss?**
* **Did you use all of the materials in your bag? What are some of the materials your team decided to use, and how did you use those materials in your design?**
* **How would you improve your enclosure if we had time?**
* **Discuss what happened for groups with different materials in their bag and how it is important to consider local and regional assets.**

It is very likely that participants at this point will come up with the testing procedure on their own, but if they are struggling re-emphasize that the heat lamps and bin are being used as models for Arizona’s climate and that the ice cubes are models for the penguins. Ask:

* **How could you use our models to evaluate the success of your design?**

The testing procedure is:

1. Once participants have created their enclosure, they should weigh the ice cube that will be the model for their penguin and record the mass in grams.
2. Then the ice cube should be put in their enclosure, and the enclosure should be placed in the testing chamber (bin with heat lamps).
3. After five minutes, participants should remove their enclosure from the testing chamber.
4. Then they should weigh their ice cube again to see how much of it has melted away. Record the mass in grams.
5. At their table, they should use the difference between their ice cube’s starting and ending weights to calculate what percent of their penguin was lost in the sweltering heat.

**The Scenario:**

Penguin Rock—Memphis Zoo

Penguin Rock at the Memphis Zoo is currently home to the African black-footed penguin, which is considered a warm weather penguin species.

Penguin Rock Opportunity:

* The zoo has been offered a chance to also house the Emperor penguin, which lives in cold climate.
* They would like you, a group of engineers, to help them prototype an penguin energy-efficient enclosure.

Penguin Rock Engineers (Teams of Students):

* What is the Problem?
* What do you need to know before you start?
* **Design a model enclosure that keeps our model penguins from melting in the hot Memphis sun.**
  + The penguins will be modeled using ice cubes.
  + The materials for your penguin enclosure are included in the plastic bag.
  + Visitors must have a 360° view of the penguin in the enclosure.
  + You have 18 minutes to complete your challenge.

The Testing Space Materials:

* Large plastic bin (hard plastic, opaque construction)
* Two heat lamps
* Each team will need to have a timer to take to the testing space

Enclosure Model Design Materials:

* Each Engineering team will be given a clear plastic cup to serve as their model penguin enclosure.
* To be able to consider and discuss local and regional assets at the end of the activity, each group will be given a plastic bag with a different combination of the materials listed.

Penguin Enclosure Materials:

Clear plastic cup (every group)

Randomly, different groups will be given a bag with a variation of the following items—

|  |  |  |
| --- | --- | --- |
| Tissues  Napkins  Aluminum foil squares  Foam sheet squares | Parchment paper squares  Tape  Construction paper squares | Printer paper  Binder clips  Rubber bands |

Penguin Materials:

* Ice cube trays (there are actually penguin ice cube trays out there)
* Freezer
* Balance
* Tray or small cup for balance