1. Identify the “Big” concept to be covered by the engineering design challenge.

   Students have listened to a podcast titled “Kill Em’ All” from NPR where various experts are discussing and arguing about whether or not to kill mosquitos, leave them alone, or to kill them in some places and not in others. Students have chosen a claim that they found most compelling and have backed it up with evidence and reasoning. Now I am challenging students to design and build a mosquito trap for scientists so that they are able to conduct more research on mosquitos. This comes as a concluding project for a bigger unit that teaches students about rigorous thinking.

2. Research appropriate learning standards associated with the topic.

   This lesson addresses HS-ETS1-1 & HS-ETS1-3.

   “HS-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants” ("HS-ETS1 Engineering Design | Next Generation Science Standards", 2018).

   “HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts” ("HS-ETS1 Engineering Design | Next Generation Science Standards", 2018).

3. Identify and discuss the different types of problem solving and declarative/procedure knowledge needed.

   This is a moderately structured problem because it is a “problem that requires varying strategies and adaptations to fit particular contexts” (Kirkley 2003). The declarative knowledge that is needed include facts, concepts, and principles. The facts that they must know include behaviors of mosquitoes. The concepts that they must be able to identify include different ways to capture mosquitos without harming them, and the principles they must know are why mosquitos behave the way they do. The procedural knowledge that is needed is that this has many ways of solving the problem. Students must figure out the best way to complete the task at hand and reach their goal.

4. Explore objectives and ancillary concepts/content covered by the project.

Students will be able to interconnect understandings, concepts, and conclusions backed with evidence and reasoning.

Objective: You must design a prototype to help scientists capture mosquitoes for further research.

5. Identify possible activities.

Create a 3D model using everyday objects such as cups, paper, tape, string, foil, pipe cleaner, straws, and rubber bands to capture mosquitoes without killing them. Students can also write about their prototype and explain why it is the best device. Students can also present finding to the class and will be judged on different criteria.

6. Select the best activity for your classroom.

3D Model of mosquito capture device is the best activity for my classroom.

References:

Kirkley, J. (2003). Principles for teaching problem solving. *Plato Learning.* (Technical Paper #4).

HS-ETS1 Engineering Design | Next Generation Science Standards. (2018). Retrieved from http://www.nextgenscience.org/dci-arrangement/hs-ets1-engineering-design