The Fire Starter Lesson Plan

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Performance Expectations, DCI, CC, Science Practice

4-PS3-4. Energy - Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [*Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.*]

- **Constructing Explanations and Designing Solutions**
  Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.
- **ETS1.A: Defining Engineering Problems**
  Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (secondary)
- **Influence of Engineering, Technology, and Science on Society and the Natural World**
  Engineers improve existing technologies or develop new ones.

Student Lesson Description

The Fire Starter involves the science practice of **Constructing Explanations and Designing Solutions** in an effort to have the students explore the variables involved with heat generation through stored energy transfer, AKA. fire starting. In order to accomplish this the students will be given a challenge to solve the problem of creating a heat generating device (fire producing device) using nothing but materials found in nature and those commonly discarded in our modern society (discarded item selections pre-organized by the teacher). The teacher will introduce the students to the topic with adequate background/logistic information which will be followed by the students creating (on paper) a model of their heat generating device. Once the students have designed their mechanisms blueprints they will then have the opportunity to construct their creation and test out its effectiveness.
The students will be introduced to the history and importance of fire (culturally, environmentally, as well as related to health and survival), ways in which stored energy can be transferred into heat, and how to design and construct solutions to the challenge of releasing that stored energy.

Activities

Activity 1: Material Investigation and Design – 30 min

- The lesson will begin with background information regarding different forms of energy, how energy is stored, and the conversion of energy.
- The teacher will then transition into a discussion involving the history and importance of fire, principles of heat generation, ignition devices (modern and traditional), and construction methodology.
- Once the students are familiar with the introductory elements of the topic (through lecture and involved Q&A) they will then move onto the hypothesis section of their project.
- The students will then divide into groups of no more than 5 and design (on paper) a device that generates heat energy using natural and manmade materials found discarded in modern society and in nature. This end goal of this "machine" is to transfer stored energy into a fire.
- Once completed, the students will begin the next part of the project: material gathering.

Activity 2: The Search Before the Build – 30 min

- Students will have the opportunity to utilize both the wild landscape of the conservation center and pre-collected manmade items (from their teachers) in which to gather materials to create their fire generating machine.
- The materials that the students use must come from the compiled group or the natural landscape. These materials may include, but are not limited to: flint, chert, rawhide, sinew, dry "cured" hardwood and softwood, antler, bone, plastic tubing, rubber, metal, wire, processed wood, plastic bottles, string, and paper.

Activity 3: Building the Machine – 30 min

- Once materials are collected and verified by the teacher as acceptable, the group will begin constructing their fire generating apparatus under the supervision and guidance of the instructor.
- Once the apparatus is constructed the students will begin to test their experiments one group at a time (additional assistance from the teacher may be necessary during the testing phase).
- The students projects are assessed on multiple levels: overall knowledge of the topic, material choices conducive with fire starting ability, and general performance of the contraptions success (did it generate heat, smoke, fire, or all three).

Activity 4: Data Review – 15 min

- The final step of this project is reviewing the data: did the contraption work? Why or why not was it successful? Was it able to generate any or all components of a fire? Did it have the proper components necessary for a fire to survive? What would you change next time if anything?
- Clean up and final thoughts/review.

1. I would like the students that undergo this lesson plan to understand the basic processes of heat generation through energy transfer and the basis of investigative science through the use of hypothesis building, experimentation, and data collection. Energy can be manifested into heat in multiple ways and with multiple materials. I would like the students to explore some of those methods.

2. The thing that I learned most from the interviews with the students was that they actually knew more than I had anticipated. These students are exposed to a great deal of information in their academic, as well as their social lives. This information, under the right conditions, can then be utilized if the students are presented with a challenging, engaging and fun project opportunity,

3. This lesson relies heavily on the inception and creation of a finished design in which the students are attempting to create fire. My assessment of the student's knowledge regarding the subject matter will be determined by the efficiency and success of their final fire creation design as well as overall understanding of energy transfer and elements of a healthy sustainable fire.

Due to my facilities non-traditional take on educational teaching this lesson plan must be completed in the same day, however if this was to be conducted in a traditional academic setting the content could be expanded to fit multiple class periods.