The following instructional plan is part of a GaDOE collection of Unit Frameworks, Performance Tasks, examples of Student Work, and Teacher Commentary. Many more GaDOE approved instructional plans are available by using the Search Standards feature located on GeorgiaStandards.Org.

Georgia Performance Standards Framework for Physical Science – GRADE 8

Unit: Science with Toys
General Task
Heat is the Name of the Game

Subject Area: Physical Science
Grade: 8

Standards (Content and Characteristics):

S8P2. Students will be familiar with the forms and transformations of energy.
   b. Explain the relationship between potential and kinetic energy.
   c. Compare and contrast the different forms of energy (heat, light, electricity, mechanical motion, and sound) and their characteristics.

S8CS2. Students will use standard safety practices for all classroom laboratory and field investigations.
   a. Follow correct procedures for use of scientific apparatus.
   b. Demonstrate appropriate techniques in all laboratory situations.
   c. Follow correct protocol for identifying and reporting safety problems and violations.

S8CS4. Students will use tools and instruments for observing, measuring, and manipulating equipment and materials in scientific activities utilizing safe laboratory procedures.
   a. Use appropriate technology to store and retrieve scientific information in topical, alphabetical, numerical, and keyword files, and create simple files.

S8CS9. Students will understand the features of the process of scientific inquiry.
Students will apply the following to inquiry learning practices:
   a. Investigations are conducted for different reasons, which include exploring new phenomena, confirming previous results, testing how well a theory predicts, and comparing different theories. Scientific investigations usually involve collecting evidence, reasoning, devising hypotheses, and formulating explanations to make sense of collected evidence.
   b. Scientific investigations usually involve collecting evidence, reasoning, devising hypotheses, and formulating explanations to make sense of collected evidence.
   c. Scientific experiments investigate the effect of one variable on another. All other variables are kept constant.
   d. Scientists often collaborate to design research. To prevent this bias, scientists conduct independent studies of the same questions.
   f. Scientists use technology and mathematics to enhance the process of scientific inquiry.
Georgia Performance Standards Framework for Physical Science – GRADE 8

Enduring Understandings:

- Energy appears in different forms such as mechanical energy, gravitational energy, heat energy, and electric and magnetic energy.
- Energy cannot be created or destroyed, but is only changed from one form into another.
- Transformations of energy usually release some energy typically in the form of heat.
- Temperature changes as heat gets transferred.
- Heat transfer occurs by conduction, convection, or radiation.

Essential Question:
Where do toys/machines get their energy, and what do they do with it?

ADMINISTRATION PROCEDURES

Pre-Assessment:

Create a concept map on a wall chart where students will write examples of “heat in games and sports”.

| Outcome / Performance Expectations: | Students will work in small groups to produce a presentation that will explain how heat/thermal energy affects a sport or game. This presentation should be graded by a rubric that has been developed prior to the activity and with student input. Students may use a multimedia presentation, podcast, video, or any other means of technology. |
| General Teacher Instructions: | The teacher will divide the class into groups of four. The groups will then assign each other jobs – leader, recorder, designer. |

The instructions for the presentation are:

- Choose a sport or game where thermal energy plays a role.
- Email the teacher with the group’s choice.
- Research the sport and the effects of thermal energy in the sport or game.
- The presentation should be no longer than ten minutes and should include multiple (more than three) examples of thermal energy. A minimum of one can be related to the human participants. A minimum of two examples must relate to the equipment being used.
- Students must include where/how does the toy or equipment get its energy and how does it use the energy.
- Students should address how the temperature changes (increase or decrease).
Examples of sports, games, and toys include skiing, running, motorcycle racing, NASCAR, skateboarding, rollerblading, riding a scooter, mood rings, yo-yos, motorized cars (*Matchbox, Hot Wheels*), battery-powered toys, etc. The list is great. Teacher note: In the above listed games/activities, friction may generate the observed thermal energy (heat). The thermal energy absorbed in the mood ring is observed as a color change. Activities such as running/playing in which the human body is the toy or apparatus, demonstrate a conversion of chemical energy (food) into kinetic energy (motion).

### Materials Needed:
- Internet access, video cameras

### Safety Precautions:
- All Safety precautions / rules to be observed as appropriate to the activity.

### Task with Student Directions:
Students are to create a ten-minute presentation on the role of thermal energy in a sport or game. The guidelines for the presentation are included in the statements above.

### Resources:
- **USA Olympic Web Site**
  - [http://www.usoc.org/](http://www.usoc.org/)
  - [http://physicsweb.org/articles/world/13/9/8/1](http://physicsweb.org/articles/world/13/9/8/1)
  - [http://www.glenbrook.k12.il.us/gbssci/phys/projects/yep/sports/spinet.html](http://www.glenbrook.k12.il.us/gbssci/phys/projects/yep/sports/spinet.html)
  - [http://btc.montana.edu/olympics/](http://btc.montana.edu/olympics/)
  - [http://www.physicsclassroom.com/Class/circles/U6L2c.html](http://www.physicsclassroom.com/Class/circles/U6L2c.html)

- **Unitedstreaming Video:**
  - *Science Investigations: Physical Science: Investigating Motion, Forces and Energy - Skiing and Energy Transformation*

### Homework / Extension:
The presentation is the extension and homework. Some of the work can be done in class, but there will be work outside of class.
<table>
<thead>
<tr>
<th>Instructional Task Accommodations for ELL Students:</th>
<th>If possible, discuss with the student their interest/knowledge about particular sports in advance and place the student in a group that has the same interests. Teachers may want to visit migrant.org and visionlearning.org in advance. These are free resources for ELL students to assist with internet research. Assign the student specific tasks to research and specific parts of the presentation in which the student is comfortable participating that meets group agreement.</th>
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<tr>
<td>Instructional Task Accommodations for Students with Specific Disabilities:</td>
<td>Students with developmental disorders such as Asperger's Syndrome, or students having Autistic tendencies display impaired social interactions and repetitive patterns of behavior. Students with ADD may display impaired social interactions without the repetitive behaviors. These characteristics make collaborative group work difficult at times. Have a discussion in advance with the student about their interests in sports and place the student in a group that has the same interests. Pending group agreement, assign the student specific tasks in the assembly. Be sure to visit the team at timed intervals to assess progress and focus. Students with reading disabilities and/or visual impairments may need to make use of the free services of readplease.com for help navigating through the internet sites.</td>
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<tr>
<td>Instructional Task Accommodations for Gifted Students:</td>
<td>Gifted students will do an extension for the assignment by addressing how the use or results of thermal energy can improve the sport. An example is how friction can be reduced to increase speed in skiing (a special wax is placed on the skis). The students could address how the wax or ski design could improve the time. All students will understand how thermal energy affects sports, but the gifted will study how the thermal energy can be changed to improve the sport.</td>
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