

Laser Gun Thermometer: An Untapped Educational Tool

Present Uses: Laser gun thermometers have many real-world applications in food service safety, automotive garages, agriculture, cold chain transportation food and pharmaceuticals, manufacturing, industrial and military purposes. They can also be used around the home to determine BBQ temperatures, test insulation effectiveness, and check refrigeration temperatures. Laser gun thermometers are a non-contact method to measure the amount of infrared external thermal energy (heat) that a given object is emitting (kinetic energy of the molecules).

Teaching Physical Science: Laser gun thermometers have many potentials uses in the science classroom and playground beyond testing the temperature of metal slides for student safety. Laser gun thermometers can be used to identify conductors and insulators in and around the school as well as to measure the transfer of heat by conduction in simple lab experiments. Also, they obviously demonstrate the transfer of heat “radiation” first hand, because laser thermometers measure infrared radiation (which is a form of radiation with longer waves than the waves emitted by visible light). They could be a quantitative tool for students to test the effectiveness of any models they construct to trap or transfer heat that they might do in a physical science lab or a STEM lesson. *Energy only moves one way from warmer to cooler objects!*

Teaching Earth and Environmental Science: Laser gun thermometers have the potential to boost Earth system lessons. Laser gun thermometers can be used on the playground and school campus to determine surface temperatures of various land surface (such as cement, asphalt, grass areas or surface water). Thus, students can quantify how different surfaces have varying abilities to absorb incoming solar radiation. This absorption capability will then impact air temperature directly above the various surfaces as they re-radiated longer radiation back out to the atmosphere. From there students can make inferences about how a heat island effect occurs in urban areas. Correspondingly, they can infer and measure water runoff temperatures; runoff can absorb heat from land surfaces, impacting river and stream water quality, thus releasing vital dissolved oxygen essential for aquatic life. Laser thermometers have great potential but there are several very important safety considerations.

How Laser Gun Thermometer Work: LASER is an acronym for *Light Amplification by Stimulated Emission of Radiation*. Laser gun thermometers are actually non-contact infrared (heat) thermometers that determine the thermal or heat energy of the surface of an object. The laser uses lens and mirrors to emit a focused beam of light that hits a given surface. The vibrating molecule motion of that object is reflected back to the thermometer, and then is absorbed by a thermopile component that converts thermal energy into electrical energy that turns the data into a digital temperature reading.

School and Student Safety Considerations – IMPORTANT!

Note: medical thermometers and laser gun thermometers are NOT the same thing. Laser gun thermometers should not be used to take body temperature for they would cause tissue damage. The laser beam from these thermometers can damage the lens and cornea of eyes just like looking directly at the sun can. Infrared laser guns are NOT medical devices! Laser thermometers should not be used by young children or older students who are not responsible or who can't consistently follow instructions and rules.

How to Use a Laser Gun Thermometer: The infrared thermometer should be the same temperature of the ambient air temperature surrounding it. They give less accurate readings on shiny objects and best on black objects. Depending on the strength of the device they can measure the distance of a non-contact object within a fraction of an inch to miles for stronger lasers. Generally, the accuracy of readings is between .1 to .2 degrees. Be sure your device is set on the temperature scale you desire (Fahrenheit or Celsius degrees). Aim and shoot; the reading will be given immediately on the digital reading panel.

Lasers as a Teaching Tool: Teachers should have practiced and be familiar with their given laser gun thermometer before even using with students. ***All safety precautions noted above are vital to the successful and safe use of this device, including safe storage and not left lying around a classroom.*** Teachers should themselves try to get readings and chart them from various surfaces around their home and school building and campuses, to see variations. Using the laser gun at different times of year and day is also useful. Whenever discussing temperatures or the transformation of thermal energy, this device under proper supervision can enhance lessons.