PBL Topic for Second Year Mechanical/Automobile Engineering:

FIDGET SPINNER

Fidget Spinners are toys that are little gyroscopes, which can spin at high speeds with little effort when spun in someone's hands. A basic fidget spinner consists of a usually two- or three-pronged (but can have up to six prongs or more) design with a bearing in its centre circular pad. They are made from various materials including brass, stainless steel, titanium, copper, aluminium, and plastic (see picture). Each fidget spinner also has two or more weights on the outside that make it spin faster and stay balanced. Bearings and the moment of inertia can vary to adjust for the design's spin time, vibration, and noise, causing unique sensory feedback.

PBL Topic for Third Year Mechanical/Automobile Engineering:

FLAT PLATE SOLAR WATER HEATER

The Challenge: Design and build a flat plate solar water heater, FPSWH, for a temperature rise of about 7 to 10oC/m length of tube/pipe at 1000 W/m2 solar radiation intensity.

Students follow the engineering design process to: (a) build a FPSWH (b) test to see if it can raise the temperature of water to desired level, and (c) use their testing results to improve the design and get as big a temperature change as possible. They apply their understanding of the three forms of heat transfer conduction, convection and radiation, as well as how they relate to energy efficiency. They calculate the efficiency of the solar water heaters during initial and final tests.

Design Specifications:

Size of FPSWH: 0.3 m x 0.2 m

Source of Incident Radiations: Sun / Bulb (about 6-8 inches above panel)

Liquid to be heated: Water at room temperature initially

Liquid Inlet—Flow Parameters: Constant head and volume flow rate

Tube carrying liquid to be heated: Of any cross-section, size and material, may be bent into any shape and any number of times. Should have only one inlet and only one outlet (no branching of tubes permitted)

Total Time allotted for heat transfer: 10 minutes

Storage Tank: Not required. Water shall be collected in a separate container (100 ml capacity)