The Higgs Boson Lesson Plan

Time: 40 minutes

Goals: To gain an understanding of the Higgs Boson. This includes Quantum Field Theory; the Standard Model of Particle Physics; and the Large Hadron Collider at CERN.

Objectives: Students will:

- Watch the "The Higgs Boson" segment of the "How small is it" video book
- Take a short quiz

Materials:

- Internet connection with a computer for viewing the "The Higgs Boson" segment on YouTube. Use the settings to view in 1080p.

Directions:

- Introduce "The Higgs Boson" segment where we'll cover force fields, matter fields, and the Higgs field. We'll build out the Standard Model, and show how the Higgs Boson was found. We'll end with a review of how small things are.
- Show the video.
- Review what they saw:
    - How quantum electro-dynamics explains electric and magnetic force fields.
    - How quantum chromo-dynamics explains the strong nuclear force.
    - How spin oscillation is needed for a particle to have mass.
    - How the Higgs Mechanism enables particles to oscillate.

Assessment:

Take a simple quiz. Print and distribute the quiz on page 2. Here are the answers:

- Is a virtual photon actually a particle?
  Answer: b) No, it doesn't have enough energy to live on its own like a particle can.
- What is the force particle for the strong nuclear force?
  Answer: c) The Gluon
- Which force can actually change one particle into another?
  Answer: c) The Weak nuclear force

The Higgs Boson Quiz

- Is a virtual photon actually a particle?

  a) Yes, a virtual photon is a photon and therefor it is a particle.
  b) No, it doesn't have enough energy to live on its own like a particle can.

- What is the force particle for the strong nuclear force?

  a) The Photon
  b) The Z Boson
  c) The Gluon
  d) The Higgs Boson

- Which force can actually change one particle into another?

  a) The electromagnetic force
  b) The strong nuclear force
  c) The Weak nuclear force
  d) Gravity