- **Interface Design**
  - Estimated time required: 75 minutes
  - Target group size: 14 people
  - Target grade level: Freshmen
- **Summary of activity**
  - Students will design an interface on an iPad that will control a musical source. They will learn to use buttons, sliders, and other controls to intuitively manipulate the sound in a desired way.
- **Pre-requisite knowledge requirements**
  - Math: None
  - Science: Should understand the concepts of pitch and frequency, different types of waves, and modulation.
  - Music: None
  - Other: Should be able to use an iPad
- **Dependencies on other SMT activities**
  - Should come after Waves and Sound so students know about the parameters (frequency, modulation amplitude, etc.) that they will be controlling.
  - Should come after Interface Performance so the students can move from using an interface to building one.
- **Learning objectives**
  - After this lesson, students should be able to use the provided iPad app to design an interface that can intuitively control the musical source.
  - List connections to math, science, and engineering: requires understanding of acoustic parameters (frequency, modulation, etc.), allows students to design and test their own interfaces as an engineer might, demonstrates how technology can be used to more easily produce desired sounds.
- **Relevant educational standards** (download Mathematics PDF and Science and Technology PDF from here, towards the bottom of the page)
  - Using reasoning to solve problems and justify the solution method (CC.2.2.HS.D.9)
  - Demonstrate the link between technology and invention/creation (3.4.10.B4)
  - Demonstrate how technological process promotes the advancement of STEM (3.4.12.A3)
- **List of materials**

    - Each student (or group) needs: An iPad, headphones, and possibly a laptop.
    - We also need a router for the conference room.
- **Detailed description of the activity**
    1. Teaching the students to design their own interface to get a better grasp of how technology alters and improves our ability to interact with music.
    2. Students have already used several nontraditional interfaces in a prior activity. Now they get to make their own. They also know about the acoustic parameters they can manipulate from 'Waves and Sound.'
    3. Buttons/sliders/XY-Pad -- different types of controls. App -- program on a mobile device.
    4. Procedure
        - Volunteers should put all the devices (iPads, and laptops if using laptops) onto the correct network, start the devices' music source (PureData patch or iPad app), and set up TB MIDI Stuff to talk to the right device.
        - Students go through the worksheet, which teaches them how to set up one control for the frequency of the audio. Then they make other controls and address them to the acoustic parameter controls in the music source.
        - Students can present their interfaces to the class. Afterwards, teachers clean everything up.
    5. There are no safety issues beyond the usual cautions to watch out for very loud sounds.
    6. If the system stops working, the device probably lost the network. Reset the network connection to make sure that it is on the right network.
- **Investigating question**
    - What are some intuitive controls (e.g., sliders) for the audio parameters you were manipulating?
- **Assessments**
    1. Any pre-activity assessment? No.
    2. Any assessment embedded within the activity? Questions on the worksheet.
    3. Any post-activity assessment? Usual survey.