## Simple Stethoscopes Catching the Beat of NGSS





#### Background Info on Stethoscopes

- Originally doctors would place an ear directly over a patient's chest in order to hear the heart
- Rene Laennec used a paper cylinder to listen to a patient's heart and then later developed a stethoscope from wood



# Background (cont'd)

 Modern designs: flexible, acoustic, binaural (2-ear), with both a bell and a diaphragm (sealed end) at the "head"



#### Content - What am I teaching here?

Function of the ear:

- Outer ear acts to funnel and amplify sound toward inner ear canal
- Ear canal is a narrow tube leading to the ear drum
- Sound waves "beat" on ear drum (other structures at involved)



# Content (cont'd)

Stethoscopes make simple ear models!

- Plastic tubing creates an extension of the ear canal
- Head end acts like the outer ear
- Diaphragm seals the end of the ear canal extension

# Content (cont'd)

 Stethoscopes can be thought of as bridges between the ear and the heart



## Let's build it!

#### From balloon's mouth end, cut 1" off neck



## Let's build it! (cont'd)

#### Stretch the balloon over the funnel



## Let's build it! (cont'd)

#### Place ear bud foam over end of tubing





# Let's build it! (cont'd)

#### Insert funnel spout into tubing



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## To do and notice

Firmly press foam end up to ear



Finding your heart:

- 1. Make a fist and put it under your chin
- 2. Drop your head to see your feet
- 3. Place stethoscope where fist touches chest
- 4. Listen carefully!



## Some considerations

- Clothing can dampen the amplitude ("volume") of vibrations
- Bare skin works best



# What am I hearing?

- The "lub, dub" sound is caused by heart valves opening and closing
- Difference in sound frequency caused by many factors



#### Now what?

- Measure your heart rate in beats per min.
- Do <u>something vigorous</u> for 1 min. (run in place, jumping jacks, anything you can do)
- Measure your heart rate again
- Discuss your results with a partner



## **NGSS Science Practices**

Formulate a testable question with a partner

- The question should be within the limits of the tool being used to answer it
- What are the limits of a stethoscope with this design?



#### More science practices

- Use the stethoscope to explain a phenomenon or describe natural processes
- Make observations and measurements
- Use calculations to discover patterns
- Base explanation on evidence
- Provide and receive critiques
- Share info with peers

