Inspiring Young People in STEM: Resources and diversity

Example checklist for adapting a resource

Resource chosen: Marvin and Milo (Institute of Physics): Activity 8

Scenario chosen: A lunchtime club for 14-16year olds in an inner city school. 75% from an ethnic minority background.

The checklist is completed using the original resource as a starting point, before considering adaptations for this scenario.

1. Is the activity safe? Highlight any risks.	Make sure there are no sharp ends on the metal coat hanger. Take care with scissors.
2. Is the activity appropriate for the age group I am working with?	It is appropriate as a **starter activity** and I plan to adapt the activity to suit my needs. The activity will be looking at sound and linking it to modern applications. The science is covered in primary school, so I would need to consult with the teacher to adapt and link to the GCSE curriculum.
3. Is the activity likely to be fun and engaging for my group of young people?	This activity alone will not be engaging for the young people for long, nor introduce ideas they're not already familiar with. However, will act as a starting point for an investigation.
4. Does the activity have a hands-on component?	Yes. Practical test of sound and vibrations travelling through different materials.
5. What STEM skills will the young people learn by doing this activity?	Scientific testing (through questioning too), communicating results, presenting their ideas.
6. Is there enough space, adequate time, staff support, etc. for me to do this activity?	May require a large space for extending the practical work. The initial pair work is easily done in a standard classroom.
7. Does this activity provide opportunities for collaboration?	Students have to work in pairs.
8. Is this activity suited to the unpredictable environment of out-of-school learning?	N/A

9. Is there additional background knowledge needed? Is it easy to locate?	Speed of sound, how sound travels. This is covered earlier in the curriculum and is easy to recap by questioning students.
10. Are the materials and supplies required by the activity easy to access and affordable? If not, can I find other materials and supplies to use in the activity?	The materials for this particular activity are affordable but I am going to adapt the activity and use a tuning fork, a slinky spring and an oscilloscope. These would have to be requested in advance from the technician.
11. Can the activity be part of an ongoing STEM theme that builds upon the previous experiences of the young people?	Yes, certainly – this activity would fit into waves and sound, and builds upon the previous experiences of young people. You could also explore the speed of light. Could do some further thinking into the non-curriculum based links for this topic. Possibly thinking about Bluetooth speakers that use surfaces, earphones vs headphones.
12. Can I make a real-world career connection to this activity?	Sound recording / sound technician (supporting resource). Audio equipment design.
13. Are there relevant modern STEM role models to reference as part of the activity?	Musicians and artists – possibly to talk about damage that loud noises can cause over a period of time. New technology. That captures the vibrations of sound and turn everything that we see into a microphone.

Further thoughts on adapting this activity:

I would start with a very basic experiment using a string telephone and ask the students if they recall this experiment in primary school. Why did it work and what did it tell us? Discuss.

Establish what is a sound wave? How could we demo a sound wave using 6-8 volunteers. How could we demo a sound wave using a slinky?

Do the coat hanger exercise. Establish why the sound is louder through questioning.

Then use a metal rack from an oven to emphasise the point the sound will be much louder using the rack as there is more metal there.

Why do vibrations travel through the metal and the string more easily than through air? Go back to the volunteers model.

How much faster does sound travel in a solid compared to a gas?

Use a video to demonstrate the speed of sound measuring speed of sound:

- http://www.bbc.co.uk/programmes/p023317q

I have chosen this because it is short and not too complicated.

You could measure the speed of sound in air using dataloggers and an oscilloscope in air, liquid and a solid depending on the availability of equipment or show videos otherwise, use online resources:

- http://seniorphysics.com/physics/PhysicsEducation_V35(6)_2000.pdf
- https://www.picotech.com/library/experiment/wave-speed-in-a-solid
- http://dataharvest.co.uk/docs/uploads/3179_ds090_3_speed_of_sound_manual_with_experiments.pdf?utm_source=resources&utm_medium=download&utm_campaign=3179_ds090_3_speed_of_sound_manual_with_experiments

Longer video is Abe Davis TED talk on new developments and how sound is important: Subtle motion happens around us all the time, including tiny vibrations caused by sound. New technology shows that we can pick up on these vibrations and actually re-create sound and conversations just from a video of a seemingly still object. But now Abe Davis takes it one step further: Watch him demo software that lets anyone interact with these hidden properties, just from a simple video. This video is 20 mins, so would need to choose the highlights and fill in the context as appropriate.