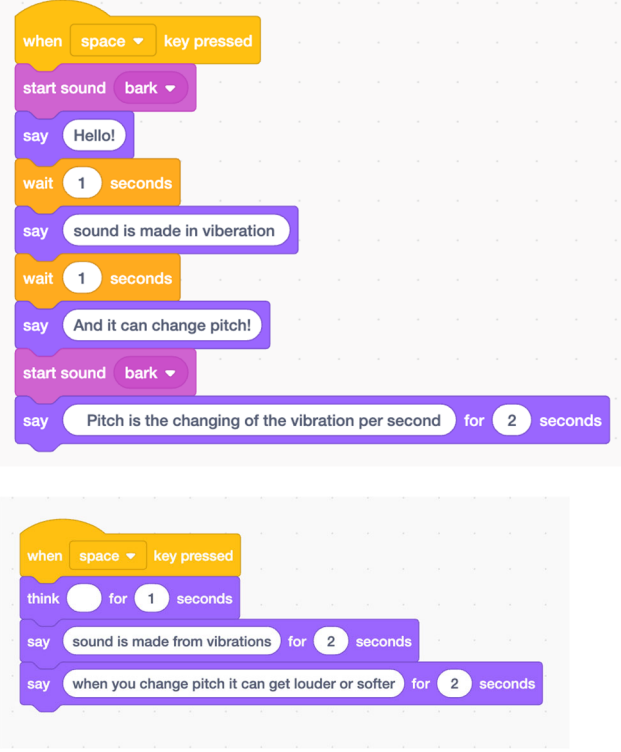
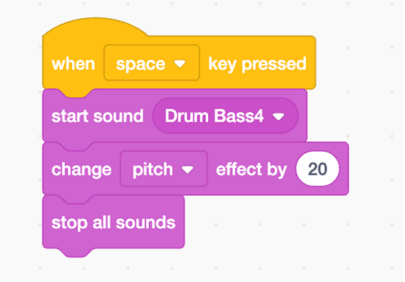
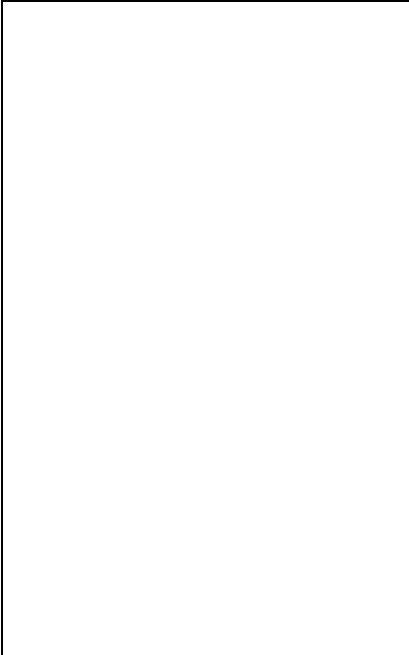


Appendix

Examples of Student Articulation of Science Understanding in Scratch

Articulated Ideas of Sound	Example of Students' Scratch Codes
Sound is made by vibration ($n = 11$)	 <p>The first code snippet shows a sequence of actions triggered by a space key press: starting a 'bark' sound, saying 'Hello!', waiting 1 second, saying 'sound is made in viberation', waiting 1 second, saying 'And it can change pitch!', starting another 'bark' sound, and finally saying 'Pitch is the changing of the vibration per second' for 2 seconds.</p> <p>The second code snippet shows a sequence of actions triggered by a space key press: thinking for 1 second, saying 'sound is made from vibrations' for 2 seconds, and saying 'when you change pitch it can get louder or softer' for 2 seconds.</p>
The pitch of sounds can change ($n = 8$)	 <p>The code snippet shows a sequence of actions triggered by a space key press: starting a 'Drum Bass4' sound, changing the pitch effect by 20, and stopping all sounds.</p>



```

when clicked
  speak hello
  set voice to kitten
  speak i am gonna explain about pitch and how sound is made
  speak first i will talk about pitch
  speak low pitch first
  play sound A Elec Piano until done
  speak now for high pitch
  play sound A Elec Guitar2 until done
  speak see how the speed of the pitch changes
  speak now for the sound
  play sound recording1 until done
  speak sound is made by bouncing from molecule to molecule into your eardrum

```

Mediums are needed to transmit sound ($n = 3$)

```

when clicked
  say Hi i'm going to teach you about SOUND!!! for 2 seconds
  say My name is r.j. for 2 seconds
  say Vibrations that travel through the air or another medium for 4 seconds
  say can be heard when they reach a person's or animal's ear. for 4 seconds
  say Sound can be clapping or yell or talk and scream. for 4 seconds
  say I'm not done. for 3 seconds
  say Do you know why it tickles when it touches your ear with your hair for 5 seconds
  say So do you????? for 3 seconds
  say Because the vibrations and the amtous. for 3 seconds

  speak how does the sound get to our ears tho
  speak back to you Olivia
  set voice to alto
  speak thats a good question
  speak sound vibrates of of molecules to get to our ears so we can hear it travels slower in gas than water water is the second fastest
  speak solids are the fastest thing sound travels through because it has more molecules

```

Sound is made by molecules: ($n = 1$)

```

when clicked
  wait 2 seconds
  say sound is made of molecules for 2 seconds
  wait 2 seconds

```