

## 1-PS4-1 Waves and Their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

- 1-PS4-1. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.** [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Planning and Carrying Out Investigations</b> Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.</p> <ul style="list-style-type: none"> <li>Plan and conduct investigations collaboratively to produce evidence to answer a question.</li> </ul> <p>-----</p> <p style="text-align: center;"><b>Connections to Nature of Science</b></p> <p><b>Scientific Investigations Use a Variety of Methods</b></p> <ul style="list-style-type: none"> <li>Science investigations begin with a question.</li> <li>Scientists use different ways to study the world.</li> </ul>	<p><b>PS4.A: Wave Properties</b></p> <ul style="list-style-type: none"> <li>Sound can make matter vibrate, and vibrating matter can make sound.</li> </ul>	<p><b>Cause and Effect</b></p> <ul style="list-style-type: none"> <li>Simple tests can be designed to gather evidence to support or refute student ideas about causes.</li> </ul>

Observable features of the student performance by the end of the grade:											
1	Identifying the phenomenon under investigation										
a	Students identify and describe* the phenomenon and purpose of the investigation, which include providing evidence to answer questions about the relationship between vibrating materials and sound.										
2	Identifying the evidence to address the purpose of the investigation										
a	Students collaboratively develop an investigation plan and describe* the evidence that will result from the investigation, including: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px;">i.</td> <td>Observations that sounds can cause materials to vibrate.</td> </tr> <tr> <td>ii.</td> <td>Observations that vibrating materials can cause sounds.</td> </tr> <tr> <td>iii.</td> <td>How the data will provide evidence to support or refute ideas about the relationship between vibrating materials and sound.</td> </tr> </table>	i.	Observations that sounds can cause materials to vibrate.	ii.	Observations that vibrating materials can cause sounds.	iii.	How the data will provide evidence to support or refute ideas about the relationship between vibrating materials and sound.				
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ii.	Observations that vibrating materials can cause sounds.										
iii.	How the data will provide evidence to support or refute ideas about the relationship between vibrating materials and sound.										
b	Students individually describe* (with support) how the evidence will address the purpose of the investigation.										
3	Planning the investigation										
a	In the collaboratively developed investigation plan, students individually identify and describe*: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px;">i.</td> <td>The materials to be used.</td> </tr> <tr> <td>ii.</td> <td>How the materials will be made to vibrate to make sound.</td> </tr> <tr> <td>iii.</td> <td>How resulting sounds will be observed and described*.</td> </tr> <tr> <td>iv.</td> <td>What sounds will be used to make materials vibrate.</td> </tr> <tr> <td>v.</td> <td>How it will be determined that a material is vibrating.</td> </tr> </table>	i.	The materials to be used.	ii.	How the materials will be made to vibrate to make sound.	iii.	How resulting sounds will be observed and described*.	iv.	What sounds will be used to make materials vibrate.	v.	How it will be determined that a material is vibrating.
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4	Collecting the data										
a	According to the investigation plan they develop, students collaboratively collect and record observations about: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px;">i.</td> <td>Sounds causing materials to vibrate.</td> </tr> <tr> <td>ii.</td> <td>Vibrating materials causing sounds.</td> </tr> </table>	i.	Sounds causing materials to vibrate.	ii.	Vibrating materials causing sounds.						
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