



# Selecting Materials for Musical Instruments: a Case Example with a Xylophone

## Instructor's Guide

Kaitlin Tyler and Elisabeth Hülse

Ansys Academic Development Team

[education@ansys.com](mailto:education@ansys.com)

This guide supports the integration of “Selecting Materials for Musical Instruments: a Case Example with a Xylophone” into the classroom.

### Case Study Package Contents:

- Read Me Instructor’s Guide
- PowerPoint document

### Age Range:

This resource was designed for ages 10-13, but can be expanded or simplified to fit most age groups.

### Learning Objectives:

After going through this activity, learners will be able to:

- Define music, sound, and musical instruments
- Describe different instrument classes based on the Hornbostel-Sachs System
- Define young’s modulus, density, and mechanical loss coefficient
- Explore material properties via Ashby property charts
- Question why we do not always pick the “best” material for a product

### Estimated Time for Completion:

This activity can be done with or without an in-class activity of creating your own instrument. A breakdown of time estimates for each section are found in the table below.

Section	Activities	Estimated Time (minutes)	
		Without activity	With activity
Introduction to Musical Instruments	Make your own instrument	~5	10-15
Hornbostel-Sachs Instrument Categories	Categorise your own instrument	~5	10-15
Choosing materials for instruments	N/A (optional videos)	15	N/A
Case example: xylophone	N/A (optional videos)	20	N/A
Conclusion	Examine properties of homemade instrument	~5	15
Total Time		50	+ 35-50

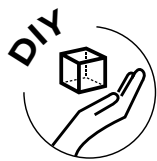
### Prior/Supplemental Knowledge Required:

The topics listed here are concepts mentioned during this unit that are not explicitly discussed. They are recommended to either cover in a prior unit or leave time during the musical instrument presentation for additional explanation.

- Properties of materials (density, Young’s modulus)
- Basics of sound (wave propagation, air vibration)

### Fundamental concepts covered:

This case study covers concepts of (1) basics of materials selection based on material properties and (2) differences between various musical instruments.



### In-class activity details: build your own musical instrument

This in-class activity is an opportunity for students to explore the musical/mechanical properties of materials prior to learning the official terminology, as well as allow for some hands-on activity during a lecture presentation

#### Equipment needed:

- Miscellaneous materials (think recyclables, paper, rubber bands, plastic bottles)
- Tape or glue
- Scissors

#### Instructions:

1. Set out materials for students to grab
2. Use the slide animation timer in the PowerPoint to allow 5 minutes\* for students to build something that creates sound- an instrument
3. After introducing the Hornbostel-Sachs System, have students take another 5 minutes\* (timer in PPT) to group themselves by category. Encourage them to get up and move around to do this!

\*If you believe 5 minutes is not enough, please extend it!



### Additional Ansys Resources:

Below are links to Ansys Educational Resources and Ansys Innovation Courses to support teaching this topic. They are ordered from most applicable (1) to least. Those that are also linked in the PowerPoint document with have an asterisk next to them.

#### Ansys Education Resources:

1. [Materials Intelligence: the Card Game\\*](#)
2. [The Materials Cube\\*](#)
3. [Materials Selection White Paper](#)
4. [Introduction to Audio Digital Signal Processing with Ansys Sound](#)

#### Ansys Innovation Courses:

- [Materials Selection with Ashby Charts\\*](#)
- [Intro to Material Performance\\*](#)
- [Intro to Material Elasticity\\*](#)

© 2024 ANSYS, Inc. All rights reserved.

## Use and Reproduction

The content used in this resource may only be used or reproduced for teaching purposes; and any commercial use is strictly prohibited.

## Document Information

This instructor's guide is part of a set of teaching resources to help introduce students to materials and materials selection.

## Ansyes Education Resources

To access more undergraduate education resources, including lecture presentations with notes, exercises with worked solutions, MicroProjects, real life examples and more, visit [www.ansys.com/education-resources](http://www.ansys.com/education-resources).

## Feedback

Here at Ansys, we rely on your feedback to ensure the educational content we create is up-to-date and fits your teaching needs.

Please click the link here out a short survey (~7 minutes) to help us continue to support academics around the world utilizing Ansys tools in the classroom.

**ANSYS, Inc.**  
Southpointe  
2600 Ansys Drive  
Canonsburg, PA 15317  
U.S.A.  
724.746.3304  
[ansysinfo@ansys.com](mailto:ansysinfo@ansys.com)

If you've ever seen a rocket launch, flown on an airplane, driven a car, used a computer, touched a mobile device, crossed a bridge or put on wearable technology, chances are you've used a product where Ansys software played a critical role in its creation. Ansys is the global leader in engineering simulation. We help the world's most innovative companies deliver radically better products to their customers. By offering the best and broadest portfolio of engineering simulation software, we help them solve the most complex design challenges and engineer products limited only by imagination.

visit [www.ansys.com](http://www.ansys.com) for more information

Any and all ANSYS, Inc. brand, product, service and feature names, logos and slogans are registered trademarks or trademarks of ANSYS, Inc. or its subsidiaries in the United States or other countries. All other brand, product, service and feature names or trademarks are the property of their respective owners.

© 2024 ANSYS, Inc. All Rights Reserved.