



Lesson 4

The Power and Potential of MRI | Unit Overview

The final lesson will conclude the basics of MRI and open up to the broader context of healthcare and biomedical engineering. Students will learn about recent advancements and the future of imaging devices while reflecting on their expanded knowledge of MRI.

Recommended Grade Levels: 6-8

Learning Objectives:

- Students should be able to describe a variety of frontier challenges in healthcare
- Students should be able to explain how MRI technology is enabling new solutions to healthcare challenges
- Students should be able to engage with the design process to develop ideas for novel solutions using principles from MR technology

Lesson Approaches:

The materials and group setups used for the lesson can vary based on three approaches. Each approach uses the interactive online lesson with worksheets and a Google Form available. Supplemental materials and assessments are available for teachers and students to expand on each lesson.

Lecture approach: A lecture style class session that uses one device to show the students the interactive lesson and a correlated worksheet for each student. A Google Form can also be answered as a whole class to both assess and discuss what the students have learned.

Materials used:

- A computer with internet access
- A large screen to project to the class
- A worksheet or access to Google Form for each student



Small group approach: A cooperative student learning approach that organizes the class into small groups, each with their own device to learn from the interactive lesson and fill out a worksheet that highlights areas of focus in the lesson. A Google Form can also be used, either within those groups or as a whole class, to elicit engagement and discussion.

Materials used:

- A computer with internet access for each group of several students
- A worksheet or access to Google Form for each student or group

Individual approach: An individual learning approach that allows students to engage with the interactive lesson at school or at home, answering questions on a worksheet along the way. This approach may be supported with classroom discussions after each lesson.

Materials used:

- A computer with internet access for each student, either a school computer or personal computer at home
- A worksheet or access to Google Form for each student



Activities:

Individual	Small Group	Whole Class
<p>Students will each write their own passages, answering to one or more of the following prompts:</p> <ol style="list-style-type: none">(1) What was the most interesting thing you've learned about MRI?(2) Why is MRI important?(3) What did you find interesting about imaging technology?	<p>Students will talk to each other to discuss the favorite thing they have learned about MRI and what they think is the most important thing to improve upon with MRI.</p> <p>Students may list their answers together and share with the rest of the class.</p>	<p>Students will be called on when they raise their hands to answer questions, such as what the most interesting thing they learned was and what is the significance of MRI in helping people.</p> <p>This activity can be managed to take less time than the rest if needed.</p>
<p>Students will draw and label an MRI machine on a piece of paper, then draw what they think imaging devices will look like in the future.</p> <p>Students should focus on what the differences are between the two and why they chose to change the design in this way.</p> <p>This can also be done in small groups where each student draws different parts of an MRI machine.</p>	<p>Each group of students will be given a problem in healthcare related to imaging. Students will discuss how MRI can be used to help solve the problem and how improvement of the MRI may help solve similar problems in the future.</p> <p>Problems may include: diagnosing neurological disorders, assessing damage after an injury, etc..</p>	<p>Students will answer questions given by the teacher to review important points and takeaways about MRI.</p> <p>Questions may be from previous worksheets to review past material, questions specific to this lesson module, or anything important the teacher wishes to cover.</p> <p>Students who give correct answers may be rewarded.</p>

Resources:

- Worksheet: [PDF] [Word Document]



Supplemental Videos

Small videos that may help teachers and students establish a basic understanding of the lesson topics.

- <https://www.youtube.com/watch?v=TStJ-MmdYvY>: TedMed Alzheimer's Detection
- <https://www.youtube.com/watch?v=vi94zBqqHrk>: Future of imaging science
- <https://www.youtube.com/watch?v=YSQRWOy2Om4>: AI in imaging and healthcare

Supplemental Reading:

- Artificial Intelligence Reconstructs Missing Data from Rapid MRI Scans. (2023, January 17). NYU Langone News.
<https://nyulangone.org/news/artificial-intelligence-reconstructs-missing-data-rapid-mri-scans> from the original
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<https://doi.org/10.31887/DCNS.2009.11.4/mbrammer>
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- Cassling. (2022, May 6). What's New in MRI Technology — 2022 Edition. [Www.cassling.com](http://www.cassling.com).
<https://www.cassling.com/blog/whats-new-in-mri-technology-2022-edition>
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- Collins, F. S., Varmus, H. (2015). A New Initiative on Precision Medicine. *New England Journal of Medicine*, 372(9), 793-795. doi:10.1056/NEJMp1500523
- Fritz, J., & Tzarfati, I. (2018). MR-guided interventions. *Magnetic Resonance Imaging Clinics*, 26(3), 421-438. doi:10.1016/j.mric.2018.02.006
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<https://doi.org/10.2463/mrms.rev.2021-0011>
- Rodriguez, E., Dr, & Parkinson, B. (n.d.). A new perspective - MRI Patient handling system for a novel head-only MRI system. Core77 Design Awards 2020.
<https://designawards.core77.com/Strategy-Research/95329/A-new-perspective-MRI-Patient-handling-system-for-a-novel-head-only-MRI-system>
- Um, Y. H., Choi, W. H., Jung, W. S., Park, Y. H., Lee, C. U., & Lim, H. K. (2017). A Case Report of a 37-Year-Old Alzheimer's Disease Patient with Prominent Striatum Amyloid Retention. Psychiatry investigation, 14(4), 521–524.
<https://doi.org/10.4306/pi.2017.14.4.521>
- The Upright MRI. (n.d.). Fonar. <https://www.fonar.com/upright-mri.html>