



Lesson 2

Imaging the Body: The MRI Machine | NGSS Standards

To further establish a background in understanding how MRI works as a whole, students will learn about the components of MRI machines, what they do independently, how they function together, and general safety measures when using an MRI machine. Students should be able to visualize the components of an MRI machine and understand how patients and doctors may interact with it by the end of the interactive lesson.

Recommended Grade Levels: 6-8

NGSS Standards in Lesson: MS ETS 1-1, MS ETS 1-4, MS ETS 1-3

In this comprehensive lesson plan, which provides an in-depth exploration into the intricacies of MRI machines, students will explore concepts that align with multiple Middle School NGSS standards, including ETS 1-1, ETS 1-4, and ETS 1-3. The lesson is designed to foster a deep understanding of MRI machine components and their functions in the context of imaging the human body. This alignment is particularly evident in the context of ETS 1-1, which calls for defining criteria and constraints for design problems with precision. Throughout this immersive learning experience, students gradually construct a robust model that encapsulates the multifaceted components and their functions within an MRI machine, a process that resonates with the principles of ETS 1-4 and ETS 1-3. The lesson plan thoughtfully nurtures the iterative testing and refinement process by dissecting the roles of each component, ranging from the main magnet to gradient coils, RF coils, computer software, the patient table, and the display console. By engaging with this comprehensive information, students gather valuable data that serves as the foundational knowledge for their understanding, ultimately facilitating the creation of a model that mirrors the intricate workings of an MRI machine. Moreover, the lesson encourages students to thoroughly scrutinize the collected data, enabling them to discern both the commonalities and distinctions among the various design solutions. As students progress, they naturally identify standout features of each component's design, a practice that subtly prepares them to conceive innovative solutions—a core concept echoed in MS ETS 1-3. These discussions align with the spirit of the standards, fostering a genuine exploration of how these identified characteristics could harmonize to enhance the overall effectiveness of an MRI machine.



NGSS Standard	NGSS Performance Expectation	Lesson Alignment Criteria
<u>MS ETS 1-1</u>	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. <u>MS-ETS1-1</u>	<ul style="list-style-type: none">- Discuss the characteristics of MRI machine and learn about the constraints of imaging a human body- Talk about MRI safety as a key design constraint in creating an imaging method
<u>MS ETS 1-3</u>	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	<ul style="list-style-type: none">- Discuss characteristic of MRI components and their functions- Describe how each part contributes to the function of the MRI machine
<u>MS ETS 1-4</u>	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. <u>MS-ETS1-4</u>	<ul style="list-style-type: none">- Develop a model that tests how the MRI machine would function without each component.- Propose a solution based on this model

Lesson Performance Expectation:

- Students should be able to describe how each component of the MRI machine functions to produce imaging of the body
- Students should be able to describe what components of MRI safety are important to consider when designing a solution using MR technology