FIELD TRIP RESOURCES FOR EDUCATORS

The NATIONAL MUSEUM OF NUCLEAR SCIENCE & HISTORY

Smithsonian Affiliate

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HELLO!

As an educator, you are creating powerful learning experiences for your students. That's our mission, too. Together we can open students' eyes to fun and learning in new ways.

This publication was designed and thoughtfully researched to help you justify the academic value of your trip to the National Museum of Nuclear Science & History and outlines how a trip to the museum at any grade level can meet both STEM and Social Studies and Language Arts State Standards.

If you have questions, please feel free to contact us.

Gabriel Nemiroff

Field Trip Standards Alignment Common Core State Standards Social Studies & English Language Arts

By focusing on the following NM Common Core State Standards, you determine how your visit to the museum fits into your class/course. You can justify the academic value of your museum field trip and ensure it addresses key learning goals within the New Mexico Social Studies and English Language Arts curricula.

These standards provide a framework for how students can engage deeply with the historical content at the National Museum of Nuclear Science & History while building essential literacy and critical thinking skills. Those focusing on history, research, and informational texts would allow them to explore nuclear science from multiple perspectives while honing their analytical, research, and communication skills.

The following are some key standards for high school, middle school, and elementary school levels that would be relevant to exploring topics like the Manhattan Project, the use of nuclear weapons during World War II, and Cold War era nuclear weapons development and proliferation.

The National Museum of Nuclear Science & History offers a variety of programs to meet your school's needs. Please refer to the museum's education webpage to view all the field trip options.

HIGH SCHOOL (GRADES 9–12)

1. Reading Informational Text (RI.9-10 & RI.11-12)

RI.9-10.1 & RI.11-12.1: Cite specific textual evidence to support analysis of primary and secondary sources.

- Students can apply this to analyzing museum exhibits, documents, or texts about the Manhattan Project, nuclear weapons, and Cold War history.

RI.9-10.2 & RI.11-12.2: Determine central ideas or information of a text; provide an accurate summary of how key events unfold

- Such as the development of nuclear weapons or the impact of the atomic bomb on Japan.

RI.9-10.6 & RI.11-12.6: Determine an author's point of view or purpose in a text,

- Students can apply this when analyzing historical speeches or documents related to nuclear policy and weapons proliferation.

2. Writing Standards (W.9-10 & W.11-12)

W.9-10.1 & W.11-12.1: Write arguments focused on discipline-specific content.

- After learning about the Manhattan Project and Cold War history, students could develop written arguments evaluating the ethics of nuclear weapons use or the effectiveness of deterrence strategies during the Cold War.

W.9-10.2 & W.11-12.2: Write informative/explanatory texts to examine complex topics

- Such as the historical development and consequences of nuclear technology.

W.9-10.7 & W.11-12.7: Conduct short research projects to answer a question or solve a problem.

- Students could research the causes and effects of nuclear proliferation or atomic culture in the U.S., using museum materials as primary sources.

3. Speaking and Listening (SL.9-10 & SL.11-12)

SL.9-10.1 & SL.11-12.1: Engage effectively in a range of collaborative discussions.

- Students could participate in group discussions or debates after viewing exhibits, such as a debate on the ethics of nuclear weapons use.

SL.9-10.4 & SL.11-12.4: Present information, findings, and supporting evidence clearly.

- Students can present on the history of nuclear science or present arguments regarding nuclear policy.

4. History/Social Studies Standards (RH.9-10 & RH.11-12)

RH.9-10.4 & RH.11-12.4: Determine the meaning of words and phrases as they are used in a text

- Particularly concerning historical and scientific terminology related to nuclear science.

RH.9-10.9 & RH.11-12.9: Compare and contrast treatments of the same topic in several primary and secondary sources.

- For example, students could compare historical accounts of the decision to drop atomic bombs with more recent scholarly analyses.

MIDDLE SCHOOL (GRADES 6-8)

1. Reading Standards for Literacy in History/Social Studies (RH.6-8)

RH.6-8.1: Cite specific textual evidence to support analysis of primary and secondary sources.

- Students can analyze museum materials and primary documents related to the Cold War, using evidence to support their understanding of nuclear proliferation.

RH.6-8.2: Determine the central ideas of a text.

- They might identify central themes in the development of nuclear science, such as the global impact of nuclear weapons on politics and international relations.

RH.6-8.4: Determine the meaning of domain-specific vocabulary.

- Students will encounter terms like “mutually assured destruction,” “radiation,” or “deterrence” and determine their meanings in the context of nuclear history.

2. Writing (W)

W.6-8.1: Write arguments focused on discipline-specific content.

- After learning about nuclear weapons development, students can write persuasive essays arguing for or against the use of nuclear weapons in WWII or Cold War policies.

W.6-8.2: Write informative/explanatory texts.

- They can write reports on the progression of nuclear technology or the cultural impact of nuclear science in the U.S. during the 20th century.

W.6-8.7: Conduct short research projects to answer a question.

- Students could research topics like the ethical considerations of the Manhattan Project or how atomic culture influenced American life in the 1950s and 60s.

3. Speaking and Listening (SL)

SL.6-8.1: Engage effectively in discussions.

- In a classroom or museum setting, students could discuss the Cold War’s nuclear arms race or the political implications of nuclear weapons development.

SL.6-8.4: Present claims and findings.

- After visiting the museum, students could give presentations on historical nuclear developments, such as the Cuban Missile Crisis or the global effects of nuclear energy.

KINDERGARTEN TO 5TH GRADE (GRADES K-5)

For Kindergarten through 5th grade Common Core State Standards for English Language Arts can help guide students’ engagement with the history presented at the National Museum of Nuclear Science & History. These standards focus on reading, writing, speaking, and listening skills, fostering historical understanding and critical thinking. Here’s how specific standards apply:

1. Reading Informational Text (RI)

RI.K.1 to RI.5.1: Ask and answer questions about key details in a text.

- Students can engage with museum exhibits by asking questions about the Manhattan Project or atomic culture, and then finding answers through guided reading of placards or museum materials.

RI.2.3 to RI.5.3: Describe the connection between a series of historical events or ideas.

- Younger students might describe the sequence of events leading up to the development of the atomic bomb or how nuclear technology changed after WWII.

RI.3.4 to RI.5.4: Determine the meaning of domain-specific words or phrases.

- Exhibits on nuclear science provide opportunities for students to explore vocabulary related to nuclear energy, radiation, and Cold War politics.

RI.4.6 & RI.5.6: Compare firsthand and secondhand accounts of events.

- Students could compare what they learn from exhibits about historical events, such as the bombings of Hiroshima and Nagasaki, with documentary or video accounts.

2. Writing (W)

W.K.2 to W.5.2: Write informative/explanatory texts.

- Students could write simple reports on the historical events surrounding the use of nuclear weapons or the development of atomic culture in the U.S.

W.3.7 to W.5.7: Conduct short research projects.

- After visiting the museum, students can research a topic like the effects of nuclear weapons on Japan and present their findings.

3. Speaking and Listening (SL)

SL.K.1 to SL.5.1: Participate in collaborative discussions.

- Younger students could engage in group discussions about what they learned from the exhibits, sharing ideas on the ethics of nuclear weapons or the impact of atomic energy on society.

SL.4.4 & SL.5.4: Report on a topic or text, presenting ideas clearly.

- Students might present on the history of the Manhattan Project or the role of nuclear weapons during the Cold War, using museum information as their source.

Field Trip Standards Alignment NM STEM Ready!

By focusing on the following STEM Ready! standards, you determine how your visit to the museum fits into your class/course. You can justify the academic value of the museum field trip and ensure it addresses key learning goals within the New Mexico science curriculum. The following are some key standards for high school, middle school, and elementary school levels that would be relevant to exploring topics like the periodic table of the elements, atoms, isotopes, and radiation, as well as understanding nuclear energy and how it can be used peacefully in the modern era. The National Museum of Nuclear Science & History offers a variety of programs to meet your school's needs. Please refer to the museum's education webpage to view all the field trip options.

HIGH SCHOOL (GRADES 9–12)

HS-PS1-8: Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during fission, fusion, and radioactive decay.

- This standard directly relates to understanding nuclear energy, fission, fusion, and radiation principles.

HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

- New Mexico's natural resources, particularly uranium, and its role in U.S. nuclear history (e.g., the Manhattan Project and nuclear testing) can be tied into this standard.

HS-PS4-4: Evaluate the validity and reliability of claims in published materials of the effects of different electromagnetic radiation frequencies when absorbed by matter.

- This can apply to understanding radiation, its effects, and safety measures related to nuclear technology.

HS-ESS3-4: Evaluate or refine a technological solution that reduces the impacts of human activities on natural systems.

- Discussions on advancements in nuclear energy, environmental impacts, and improvements in radiation management can tie into this standard.

HS-PS3-3: Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

- A focus on nuclear energy as a method of converting mass into energy (via fission or fusion) connects to this performance expectation.

CROSSCUTTING CONCEPTS AND CONNECTIONS:

- **Cause and Effect:** Understanding the cause-and-effect relationships within nuclear reactions, radioactive decay, and historical events like the Trinity Test.
- **Energy and Matter:** Tracing the flow of energy through nuclear processes (fission and fusion) and how it impacts the matter in the environment.
- **History of Science:** Linking New Mexico's pivotal role in nuclear history (e.g., the Manhattan Project and Los Alamos National Laboratory) to the broader development of nuclear science.

MIDDLE SCHOOL (GRADES 6–8)

MS-PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures.

- Students can relate this to understanding the atomic structure and processes involved in nuclear energy and radiation.

MS-PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

- This can apply to the development of nuclear materials, including uranium mining in New Mexico, and its impact on society.

MS-PS3-4: Plan an investigation to determine the relationships among energy transferred, type of matter, mass, and change in kinetic energy.

- This standard can explore how nuclear energy works, focusing on the transfer and transformation of energy within a nuclear reaction.

MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing human environmental impact.

- Discussing the environmental impact of nuclear energy and waste management could connect to this standard, particularly in New Mexico's role in nuclear testing and its consequences.

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ELEMENTARY SCHOOL (GRADES K–5)

At the elementary school level, the museum can provide learning experiences that align with New Mexico's STEM Ready! Science Standards in broader STEM topics, including foundational concepts of energy, matter, technology, and the environment. While nuclear science might not be directly addressed at this level, many of the cross-cutting concepts in STEM education can still be tied to museum exhibits and experiences.

These standards help elementary students build a foundation in STEM, fostering curiosity and early problem-solving skills that are essential for their future academic success in understanding more advanced concepts like nuclear science. The field trip would provide students with enriched and interactive STEM learning experiences that strengthen their academic programs.Here are some relevant elementary school (Grades K-5) standards that could apply:

KINDERGARTEN TO GRADE 2

K-PS2-1: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

- The museum's STEM exhibits often include interactive activities that allow students to explore forces and motion, which could lay the groundwork for understanding more complex concepts like energy transfer.

K-PS3-1: Make observations to determine the effect of sunlight on Earth's surface.

- While this standard focuses on solar energy, it could be a foundation for introducing the idea of energy production in different forms, including nuclear energy, in a very basic way.

1-PS4-1: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

- Exhibits that involve sound, waves, and vibrations could tie into this standard, preparing students for later lessons on electromagnetic waves, radiation, and nuclear energy.

2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

- This could connect to basic ideas about different types of materials (e.g., metals, minerals, and energy resources like uranium) used in STEM fields, with ties to understanding New Mexico's role in resource mining.

GRADES 3-5

3-PS2-1: Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

- Interactive exhibits about energy and motion can help students build a foundational understanding of forces and energy, which are critical for grasping nuclear processes in later grades.

4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

- The basics of energy transfer, especially through light and heat, can be introduced through interactive exhibits on energy, including solar power and electricity, laying the groundwork for more complex energy concepts like nuclear energy in the future.

5-PS1-3: Make observations and measurements to identify materials based on their properties.

- Students can explore the properties of different materials, including metals and elements, which introduces them to the broader idea of materials used in scientific and industrial applications, like those found in nuclear science.

5-PS3-1: Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

- While this focuses on biological processes, it introduces students to the concept of energy transformations, which can be extended to understanding different forms of energy production, such as nuclear energy, later on.

CROSSCUTTING CONCEPTS FOR GRADES K-5

- **Cause and Effect:** Understanding simple cause-and-effect relationships through interactive exhibits (e.g., how pressing a button generates light or sound).
- **Energy and Matter:** Building foundational knowledge of how energy is produced, transferred, and used, even in simple contexts like light, heat, and sound.
- **Systems and System Models:** Understanding how parts of a system work together (e.g., circuits or simple machines), which is relevant in both nuclear science and broader STEM fields.

ADDITIONAL STEM CONCEPTS

The museum also provides a wide range of hands-on activities that could support broader STEM fields, such as: Engineering Design (K-2-ETS1 & 3-5-ETS1): The museum's focus on technology and engineering allows students to engage with problem-solving tasks and design challenges, which aligns with engineering standards, including defining problems, generating solutions, and testing models.

Environmental Awareness: Basic lessons on energy sources (e.g., solar, wind, and nuclear) and their environmental impact can be introduced to foster early environmental literacy, aligning with sustainability standards that students will build on later.

Ready to Book Your Field Trip but Have More Questions?

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