NEW MEXICO ACADEMY OF SCIENCE

Affiliate of AAAS and NAS **Founded in 1902**

Presenter
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NMAS: Director, Junior Academy of Science; NAAS, AAAS Delegate Section Y

http://www.nmas.org
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Advocate and Resource for Science and Science Education

- Open to any person interested in Science or Science Education in New Mexico
- Programs with topics of social, economic, and political interest in all science fields

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NMAS Goals

- Foster scientific research and scientific cooperation
- Increase public awareness of the role of science in human progress and human welfare
- Promote science education throughout New Mexico.

Why Join?

- Gives a voice to science professionals, university professors, graduate students, science teachers and students in all grades
- Provides professional input to state and local government entities including the NM Public Education Department
- Supports science education at all levels

NMAS PROGRAMS

- Jr. Academy of Science
- Outstanding Teachers Awards
- Annual Meeting
- Journal of Science
- National Youth Science Camp

New Mexico Junior Academy of Science
Research Paper Competition
For Students Grades 6-12

- Teaches communicating their work to others
- Encourages organized thinking
- In conjunction with Regional and State Science and Engineering Fairs
- Cash awards

NMJAS Research Paper Competition

- Enter competition at one of the 6 regional science fairs
- Competition consists of both a written paper and an oral presentation (No Science Fair required)
- Deadlines for written paper and oral PP are listed on the NMJAS website http://www.nmas.org/junior-academy-of-science.html
- First and second place regional winners advance to the State competition
- Best papers are published in the NMAS Journal of Science

Outstanding Science Teacher Awards

For K-12 STEM Teachers or Informal Educators

- Annual nominations of K-12 Stem teachers or informal educators
- Winners are guests at the NMAS annual meeting
- Deadline for nominations is October 1st
- Nomination from administrators, peers, or self-nomination

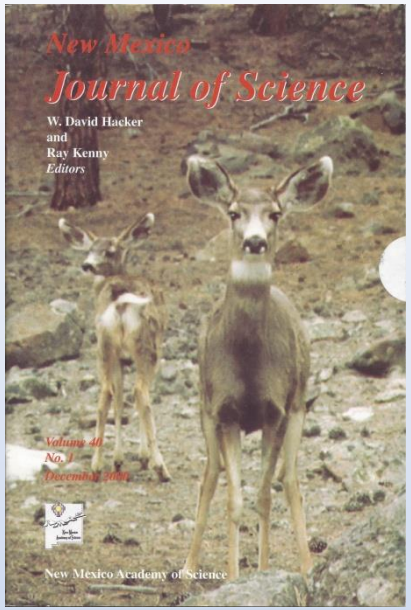
- Nomination forms at **www.NMAS.org**

NMAS Annual Meeting
For the General Public, Professionals & Educators

- Distinguished keynote speaker, concurrent sessions, panels, poster presentations, and competitions
- Participants --science professionals, university professors, graduate students, and secondary students
- Co-sponsored by other science organizations
- Open to the public each November

NMAS Journal of Science

- Published annually
- Single or Multiple Topic
- Juried
- Jr. Academy Award Papers
- Abstracts from Poster Presentations
- Purchase back-issues on-line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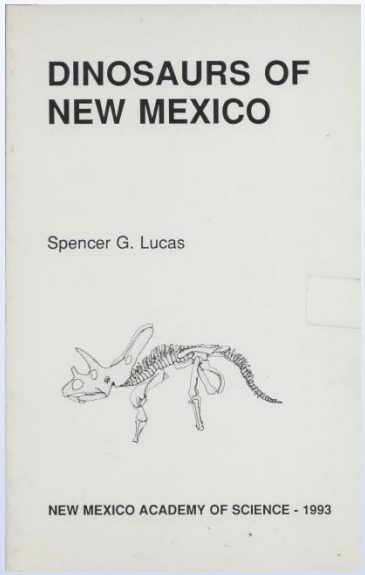
Journal of Science
W. David Hacker
and
Ray Kenny
Editors
New Mexico Academy of Science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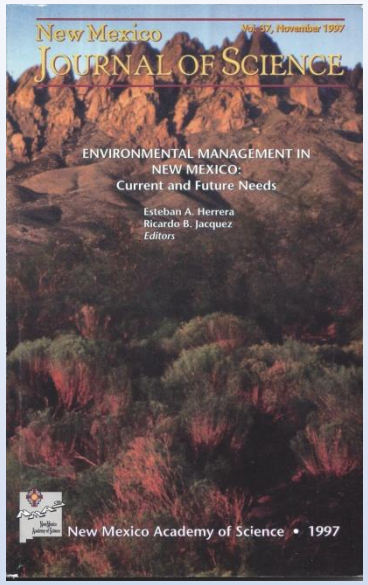
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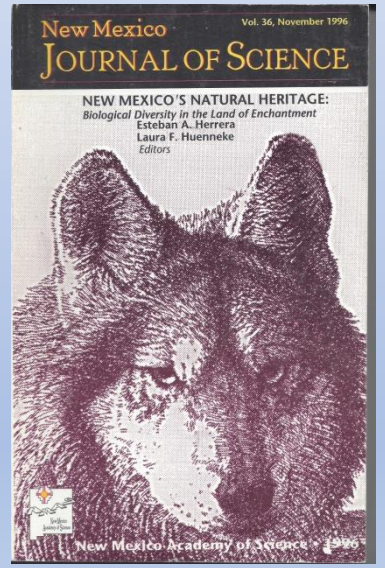
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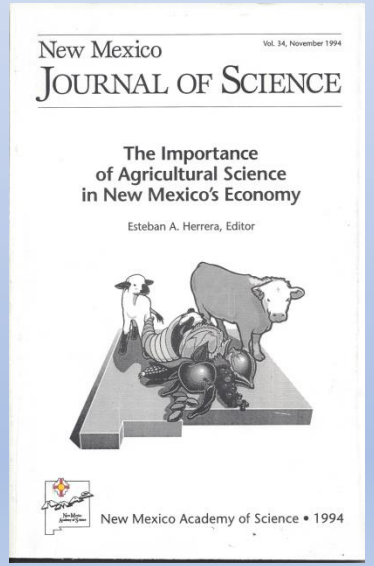
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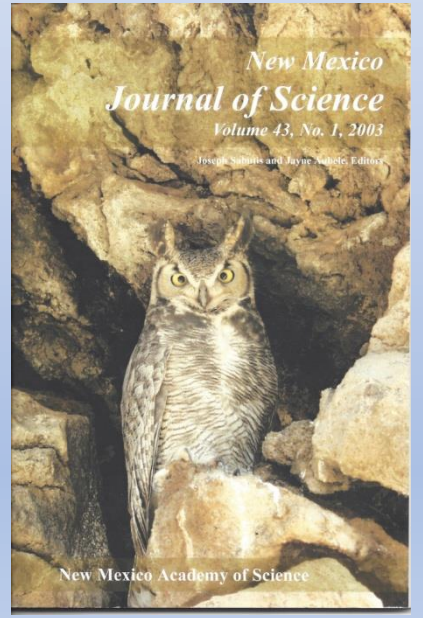
New Mexico
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Volume 43, No. 1, 2003
New Mexico Academy of Science

National Youth Science Camp
For Two Graduating New Mexico High School Seniors

- All Expenses Paid to West Virginia
- Two candidates and two alternates
- Leadership in school and community
- Interest in the sciences required
- FAQ at http://www.nysc.org

Annual Dues or Make a Donation to NMAS

- Regular Membership $25
- Student Membership $15
- Institutional Membership $25
  Libraries
- Life Membership $400

Contact Us

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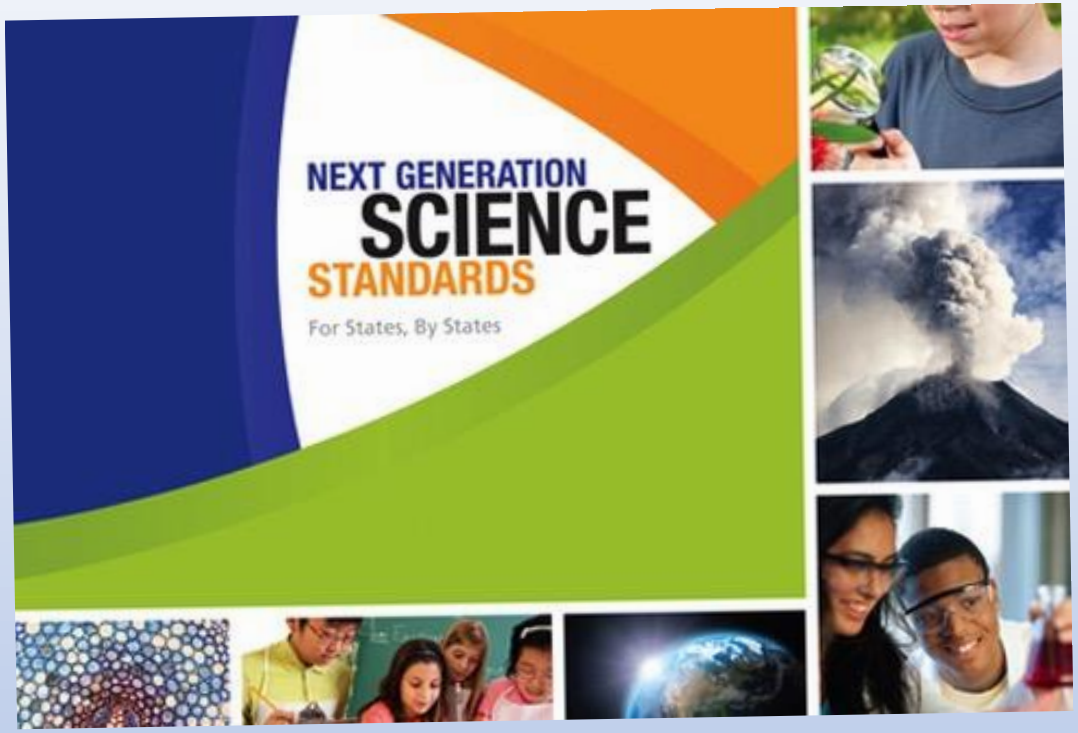
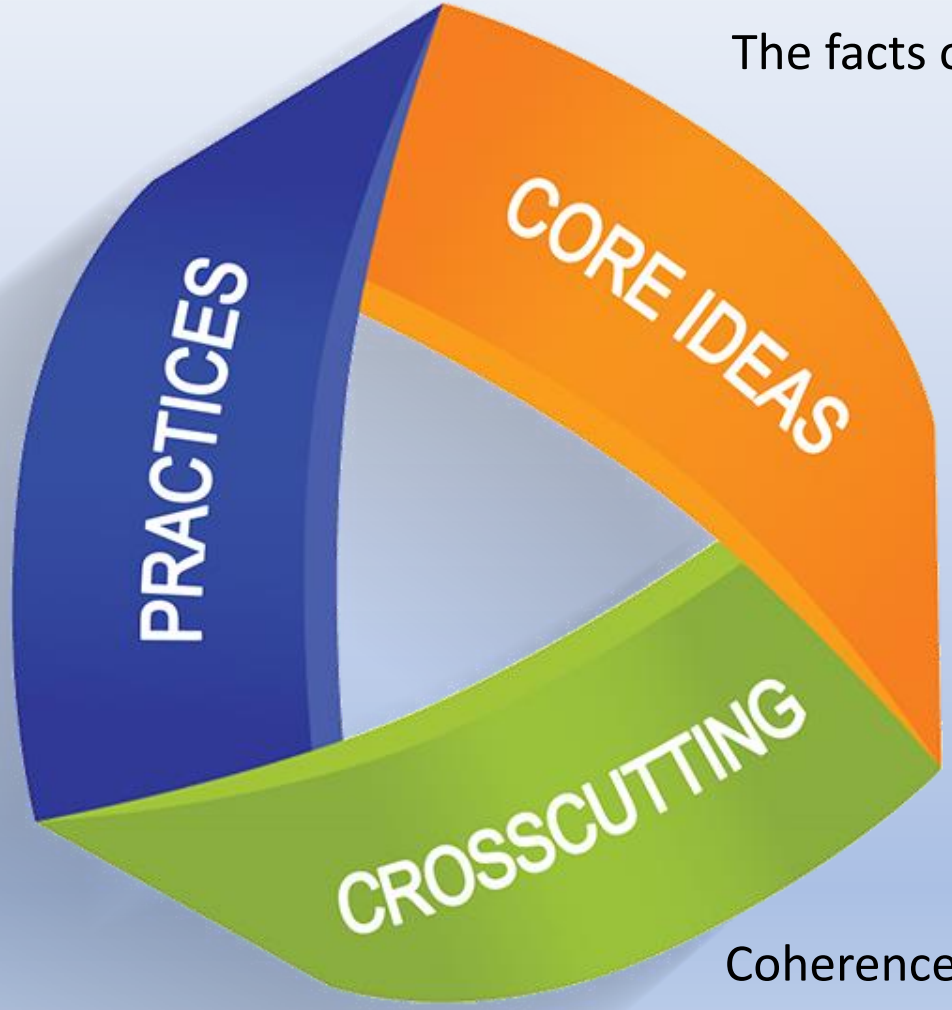


NMAS Student Programs Support NGSS

NGSS Logo – Three Dimensions

The facts of science + technology

What students do



Coherence across disciplines

Science and Engineering Practices

Asking questions and defining problems

A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world(s) works and which can be empirically tested.

Developing and using models

A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.

Planning and carrying out investigations

Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters.

Analyzing and interpreting data

Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools—including tabulation, graphical interpretation, visualization, and statistical analysis—to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results.

Using mathematics and computational thinking

In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; solving equations exactly or approximately; and recognizing, expressing, and applying quantitative relationships.

Constructing explanations and designing solutions

The end-products of science are explanations and the end-products of engineering are solutions. The goal of science is the construction of theories that provide explanatory accounts of the world. A theory becomes accepted when it has multiple lines of empirical evidence and greater explanatory power of phenomena than previous theories.

Engaging in argument from evidence

Argumentation is the process by which evidence-based conclusions and solutions are reached. In science and engineering, reasoning and argument based on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem.

Obtaining, evaluating, and communicating information

Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity.

Disciplinary Core Ideas

Life Science	Earth & Space Science	Physical Science
From molecules to organisms: Structures and processes LS1.A: Structure and function LS1.B: Growth and development of organisms LS1.C: Organization for matter & flow in organisms LS1.D: Information processing	**Earth's place in the universe** ESS1.A: The universe and its stars ESS1.B: Earth and the solar system ESS1.C: The history of planet Earth	**Matter and its interactions** PS1.A: Structure and properties of matter PS1.B: Chemical reactions PS1.C: Nuclear processes
Ecosystems: Interactions, energy, and dynamics LS2.A: Interdependent relationships in ecosystems LS2.B: Cycles of matter and energy transfer in ecosystems LS2.C: Ecosystem dynamics, functioning, and resilience LS2.D: Social interactions and group behavior	**Earth's systems** ESS2.A: Earth materials and systems ESS2.B: Plate tectonics and large-scale system interactions ESS2.C: The roles of water in Earth's surface processes ESS2.D: Weather and climate ESS2.E: Biogeology	**Motion and stability: Forces and interactions** PS2.A: Forces and motion PS2.B: Types of interactions PS2.C: Stability and instability in physical systems
Heredity: Inheritance and variation of traits LS3.A: Inheritance of traits LS3.B: Variation of traits	**Earth and human activity** ESS3.A: Natural resources ESS3.B: Natural hazards ESS3.C: Human impacts on Earth systems ESS3.D: Global climate change	**Energy** PS3.A: Definitions of energy PS3.B: Conservation of energy & energy transfer PS3.C: Relationship between energy & forces PS3.D: Energy in chemical processes & everyday life
Biological evolution: Unity and diversity LS4.A: Evidence of common ancestry and diversity LS4.B: Natural selection LS4.C: Adaptation LS4.D: Biodiversity and humans		**Waves and their applications in technologies for information transfer** PS4.A: Wave properties PS4.B: Electromagnetic radiation PS4.C: Information technologies & instrumentation
Engineering, Technology, and the Application of Science		
ETS1.A: Defining and delimiting engineering problems ETS1.B: Developing possible solutions ETS1.C: Optimizing the design solution		

Crosscutting Concepts

Patterns

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

Cause and effect

Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

Scale, proportion, and quantity

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

Systems and system models

...n is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

Energy and matter

Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.

Structure and function

The way an object is shaped or structured determines many of its properties and functions.

Stability and change

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

Science & Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations

} Science

4. Analyzing and interpreting data
5. Using mathematics and computational thinking

} Math

6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

} English

Student Research & Engineering Practices

Cascading of Steps in the Process for Student Research Experiments

A sample investigation might involve:

Develop and pose a testable scientific question (Practice 1)

↳ Design a study and collect associated data (Practice 3)

↳ Analyze and interpret those data (Practice 4)

↳ Revise a model based on data analysis (Practice 2)

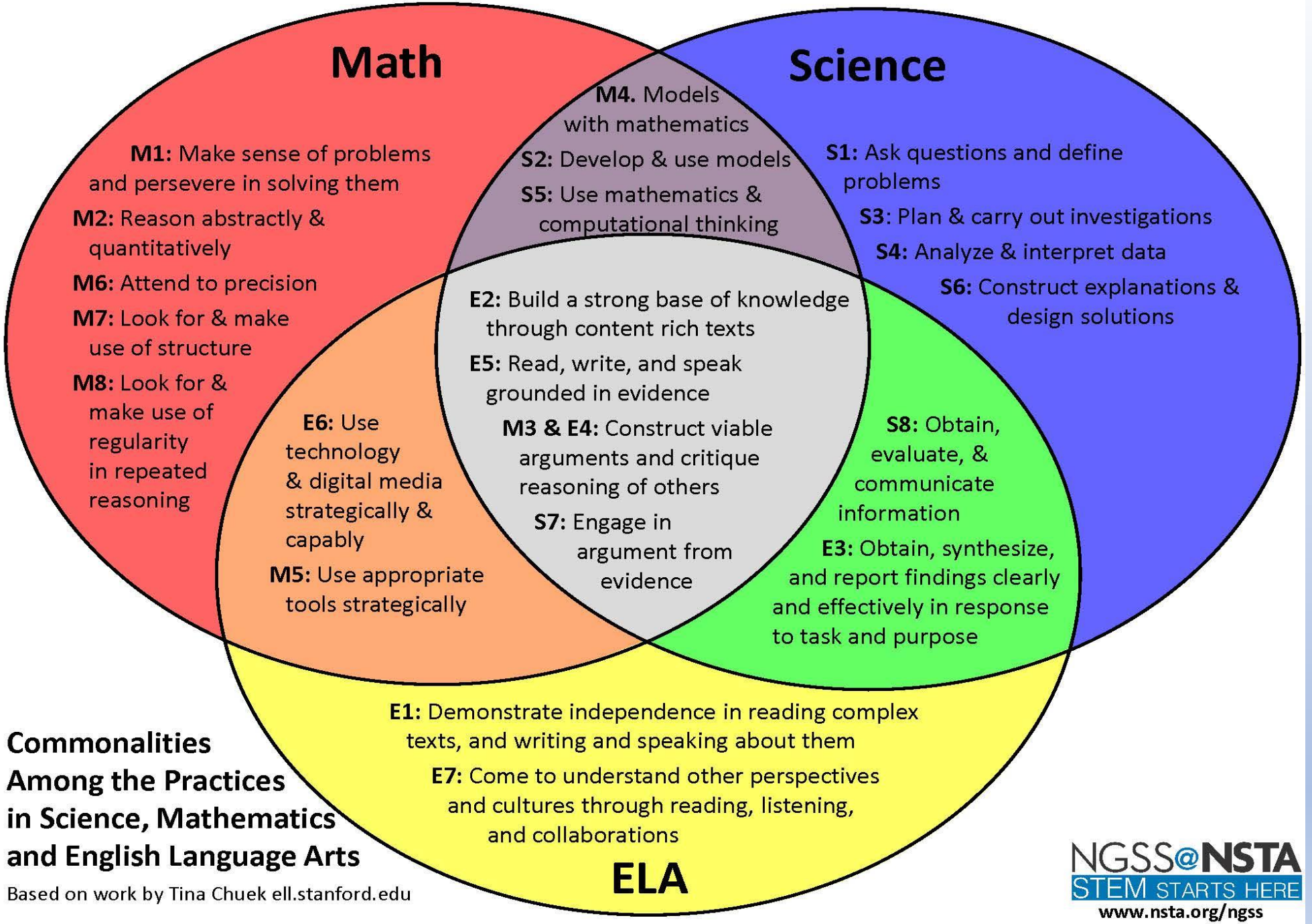
↳ Represent & communicate results to an audience (Practice 8)

Teaching Paper Writing in the Classroom

Use an experiment performed by all students.

Assign a small portion of the paper writing task to a small group of students. Include:

- ABSTRACT
- Body of the paper
  - INTRODUCTION METHODS
  - RESULTS DISCUSSION
  - CONCLUSIONS (with recommendations)
- ACKNOWLEDGMENT REFERENCES



Commonalities Among the Practices in Science, Mathematics and English Language Arts

Based on work by Tina Chuek ell.stanford.edu

NGSS@NSTA
STEM STARTS HERE
www.nsta.org/ngss

Next Generation Science Standards are aligned with Common Core Math & Common Core English Language Arts Curriculum

NM 6 Standards Feature Local Science

1-SS-1 NM. Obtain information about how men and women of all ethnic and social backgrounds in New Mexico have worked together to advance science and technology.

5-SS-1 NM. Communicate information gathered from books, reliable media, or outside sources, that describes how a variety of scientists and engineers across New Mexico have improved existing technologies, developed new ones, or improved society through applications of science.

MS-ESS3-3 NM. Describe the advantages and disadvantages associated with technologies related to local industries and energy production.

HS-LS2-7 NM. Using a local issue in your solution design, describe and analyze the advantages and disadvantages of human activities that support the local population such as reclamation projects, building dams, and habitat restoration.

HS-SS-1 NM. Obtain and communicate information about the role of New Mexico in nuclear science and 21st century innovations including how the national laboratories have contributed to theoretical, experimental, and applied science; have illustrated the interdependence of science, engineering, and technology; and have used systems involving hardware, software, production, simulation, and information flow.

HS-SS-2 NM. Construct an argument using claims, scientific evidence, and reasoning that helps decision makers with a New Mexico challenge or opportunity as it relates to science.

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