

EXPERIENCE

true inquiry.

Experience Science and Technology Concepts™

The most comprehensive, inquiry-centered science curriculum.

Implementing STEM in Your Classroom with Carolina™ Curriculum & the Smithsonian Institution



Smithsonian Institution
National Science Resources Center

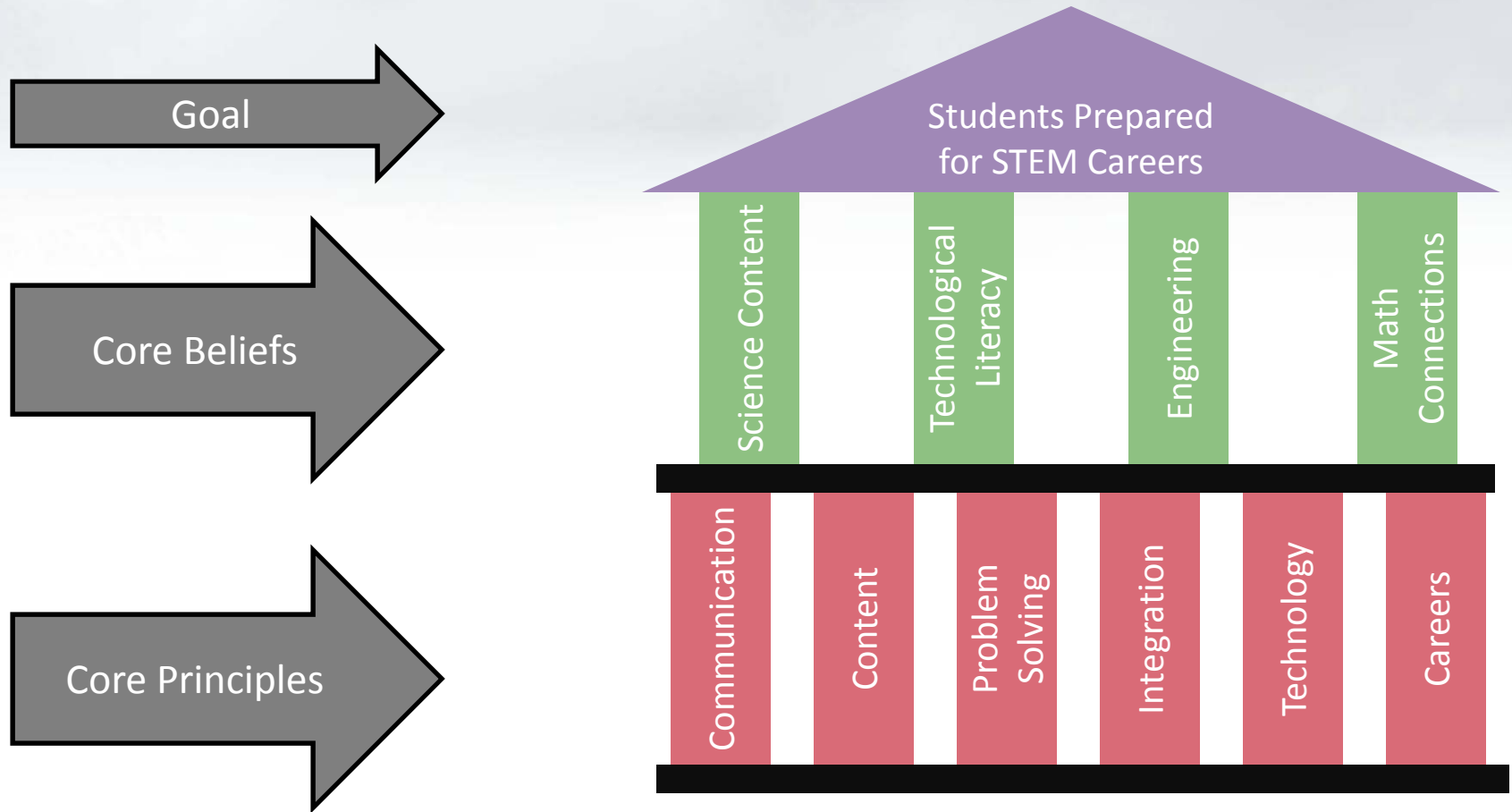


Adopting a **STEM** Philosophy

- **STEM in Action**
- Foundation of STEM Education
- Science and Technology Concepts™
Program



STEM in Action



STEM in Action

We will separate into groups to explore activities from two of the STC Program™ units. Be prepared to share STEM examples.

- STC PROGRAM™ unit: *Motion and Design*, Lesson 7: Testing the Effects of Rubber Band Energy
In this modified investigation, participants will examine different energy sources they can use to drive their K'NEX® vehicles.
- STC PROGRAM™ unit: *Motion and Design*, Lesson 11: Building a Propeller-Driven Vehicle
In this modified investigation, participants will compare a K'NEX® propeller-driven vehicle with an axle-driven vehicle.
- STC-SECONDARY PROGRAM™ unit: *Experimenting with Forces and Motion*, Lesson 4: The Force of Friction
In this modified investigation, participants will examine different surfaces upon which to drive their K'NEX® vehicles.

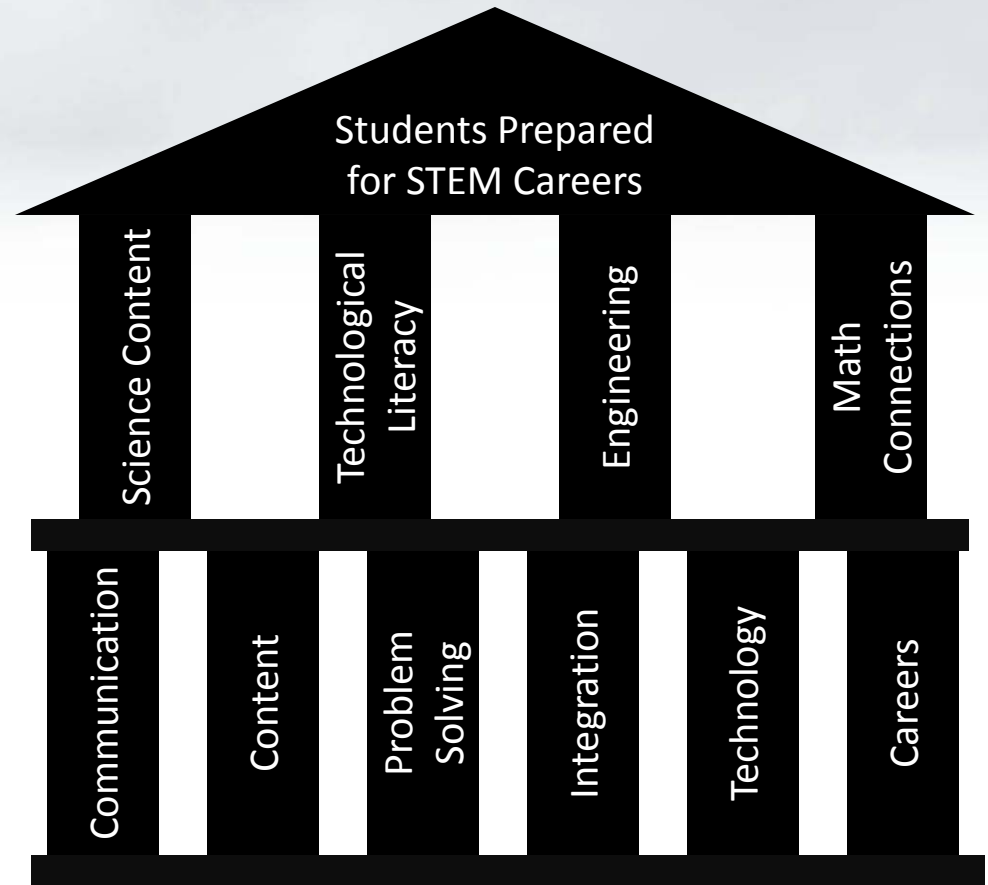
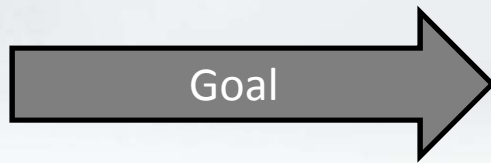


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Foundation of **STEM Education**

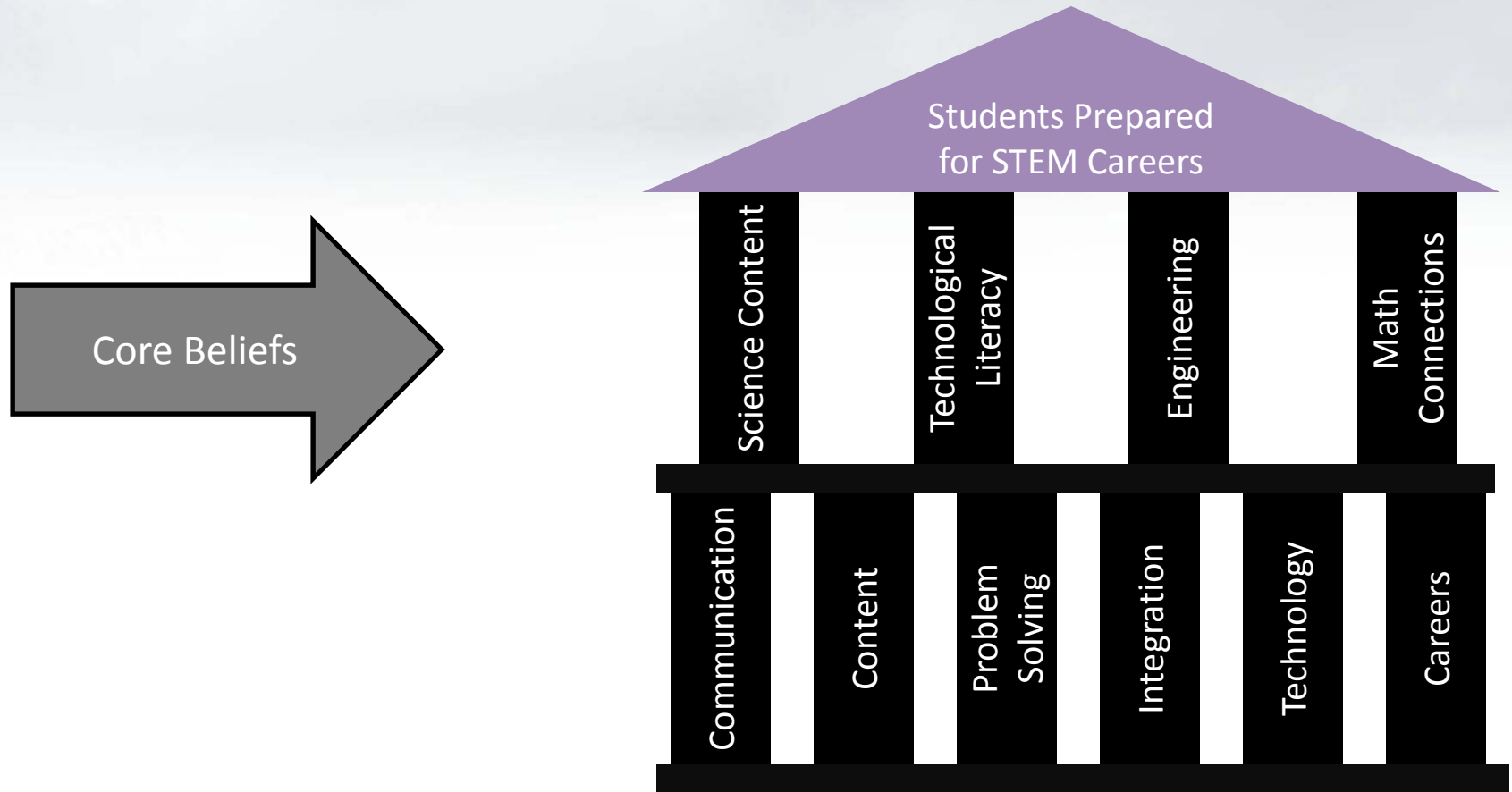


Goals of **STEM** Education

- STEM Education is designed to
 - ✓ – increase student interest in STEM fields.
 - ✓ – prepare students to pursue higher education.
 - ✓ – educate all students to become 21st-century workers.



Foundation of **STEM Education**



Beliefs of **STEM** Education

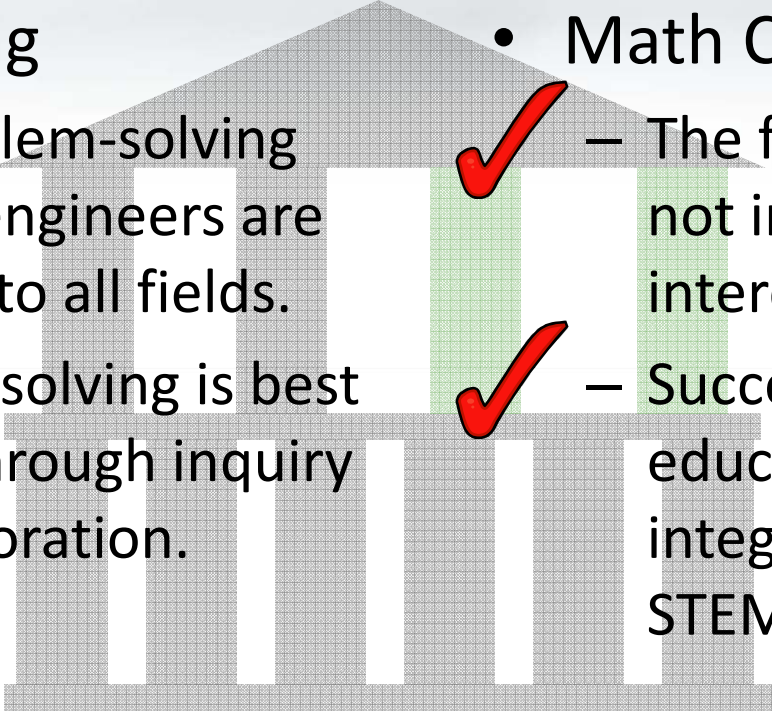
- Science Content

- ✓ – Students must understand science content.
- ✓ – Depth of understanding is more important than breadth of topics.

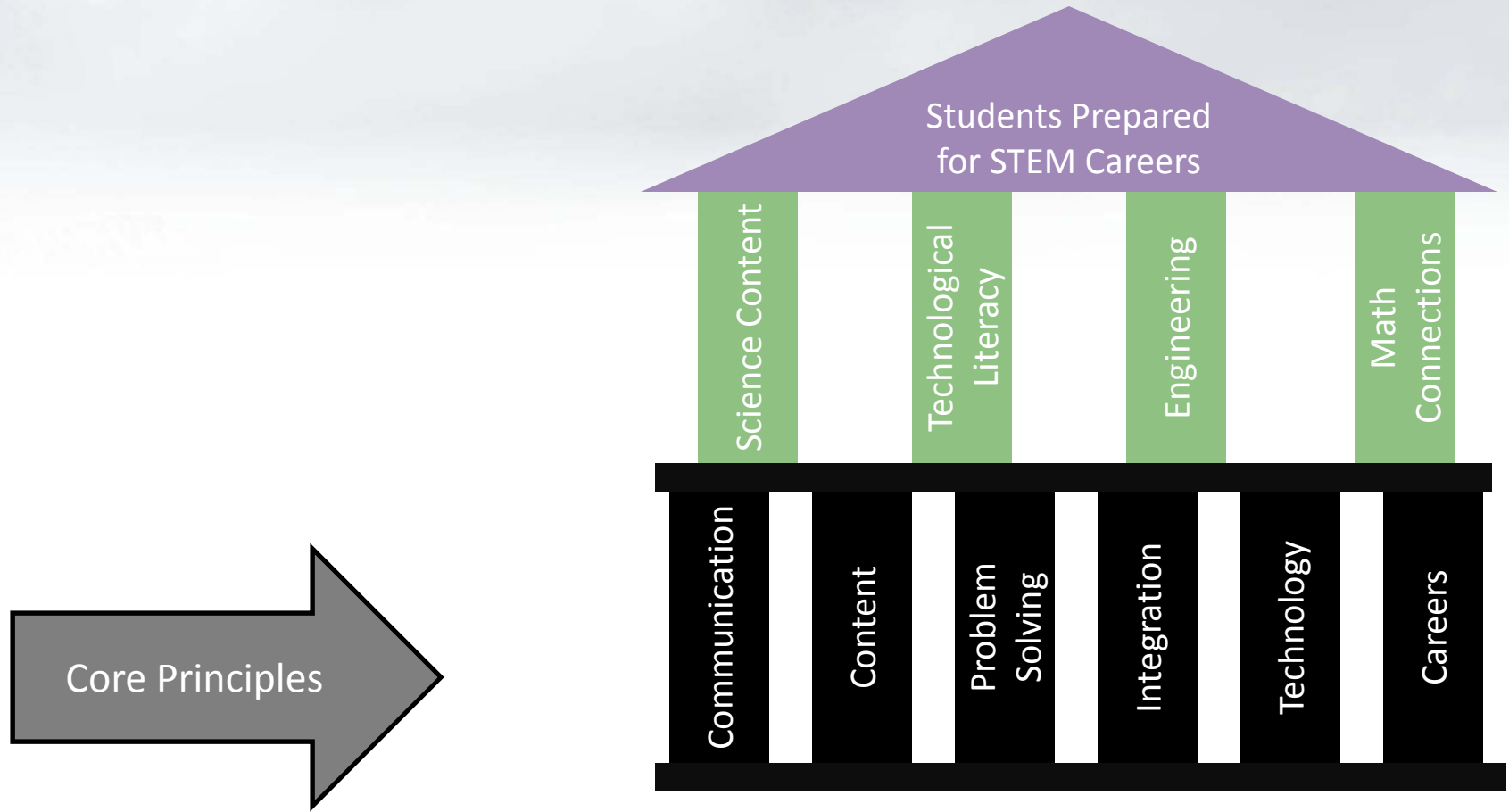
- Technological Literacy

- ✓ – Technology will only increase in importance for the next generation.
- ✓ – All students should feel comfortable working with current and future technologies.

Beliefs of **STEM** Education

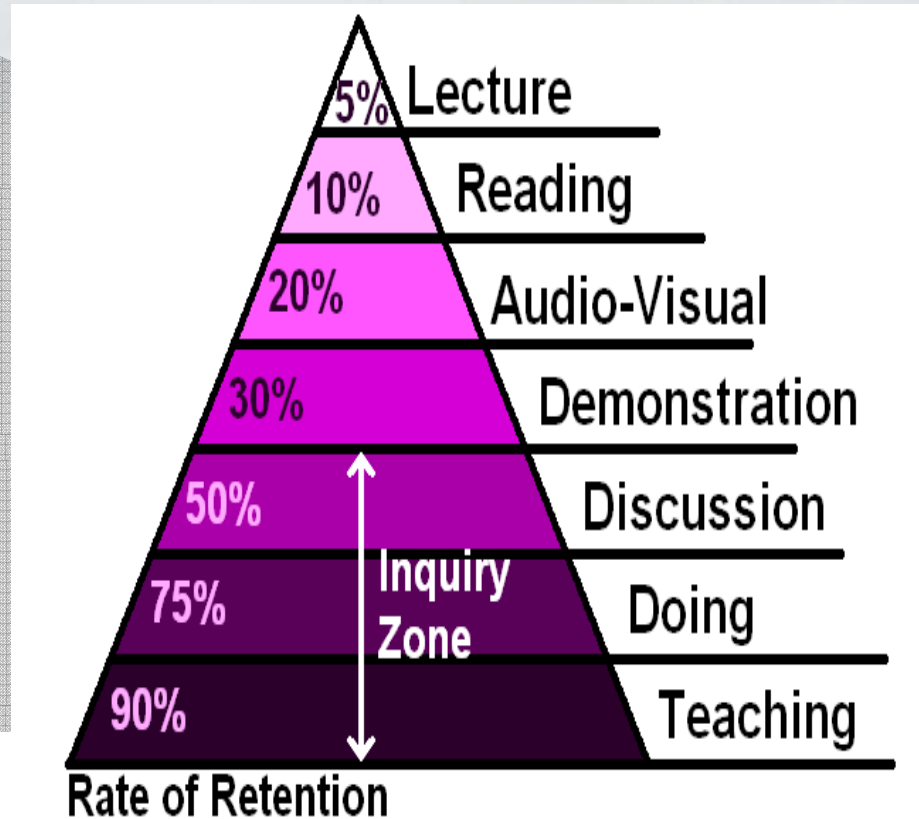
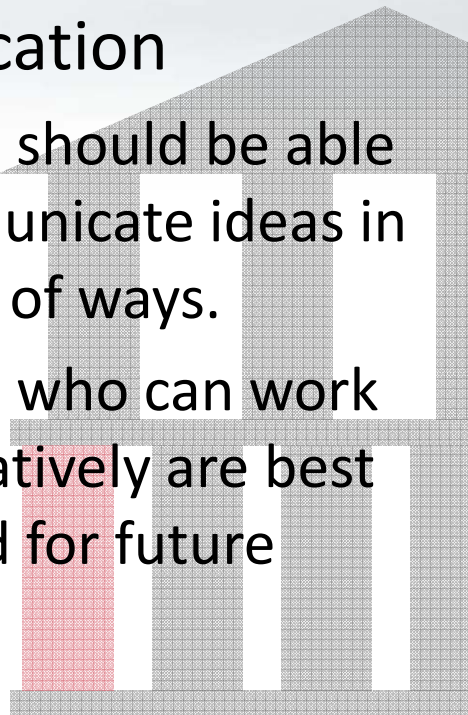
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- Engineering
 - ✓ – The problem-solving skills of engineers are relevant to all fields.
 - ✓ – Problem solving is best taught through inquiry and exploration.
 - Math Connections
 - ✓ – The fields of STEM are not independent, but interconnected.
 - ✓ – Successful STEM education requires an integration of the four STEM fields.

Foundation of **STEM Education**



Principles of **STEM** Education

- Communication
 - Students should be able to communicate ideas in a variety of ways.
 - Students who can work collaboratively are best prepared for future careers.



Principles of **STEM** Education

- Content
 - Students need a rich depth of content to apply in future careers.
 - Understanding a concept is more important than knowing a fact.
 - Naming isn't necessarily knowing.



Principles of **STEM** Education

- Problem Solving
 - Engineering's key tool is the use of systematic problem solving.
 - Students need practice with open-ended questions to develop problem-solving skills.



Principles of **STEM** Education

- Integration
 - Science, technology, engineering, and math are not disjointed, but aligned and unified.
 - Students should be given activities that highlight this integration of topics.



Principles of **STEM** Education

- Technology
 - In school, as in life, technology should be increasingly integrated into all activities.
 - Students should understand technology as more than computers, including all tools used to make life easier.



Principles of **STEM** Education

- Careers
 - Students must be taught about the importance of STEM to future careers.
 - Educators should identify careers in STEM and the application of STEM in all work.



Principles of **STEM** Education

- STEM Principles
 - The matrix is a model for the Next Generation Framework.

STEM Evaluation Matrix			
Topic	Primary Grades (K-2)	Intermediate Grades (3-5)	Secondary Grades (6-12)
Collaboration with peers and communicating information to others	Expectation: Students can verbally communicate their ideas. Students begin to communicate their ideas in a written form, including text, charts, and illustrations.	Expectation: Students can participate in discussions by listening and sharing. Students can read and evaluate written texts.	Expectation: Students can find and share information in written communications. Students can participate in high-level discussions in which they evaluate opposite sides of an argument.
Creating a depth of content rich in discovery and real-world applications	Expectation: Students begin to explore STEM concepts through examples in the world around them.	Expectation: Students develop an understanding of STEM concepts related to daily life.	Expectation: Students study deeper and more abstract STEM concepts beyond their daily lives.
Employing the concepts of engineering and Problem Solving	Expectation: Students work to find solutions to simple problems.	Expectation: Students can participate in discussions by listening and sharing. Students can read and evaluate written texts.	Expectation: Students test possible solutions and evaluate outcomes.
Connecting the concepts of Science, Technology, Engineering, and Math	Expectation: Students work using STEM concepts in a variety of methods.	Expectation: Students begin to recognize the connections between the STEM concepts.	Expectation: Students clearly identify how concepts in STEM are interconnected.
Technological literacy and the use of technology in daily life	Expectation: Students can use age-appropriate tools for measurement and in collecting information.	Expectation: Students can identify and choose appropriate tools to extend their senses.	Expectation: Students can identify and use the tools of STEM professionals.
Exploring STEM careers and how STEM concepts apply to society	Expectation: Students identify careers that use STEM skills and concepts.	Expectation: Students can identify where some of the STEM skills and concepts they have learned are connected to different careers.	Expectation: Students research and explore careers in STEM and the requirements of those careers.

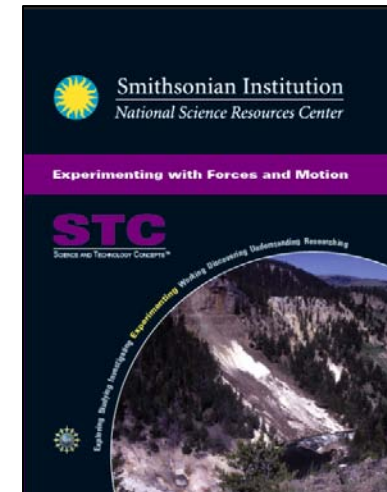
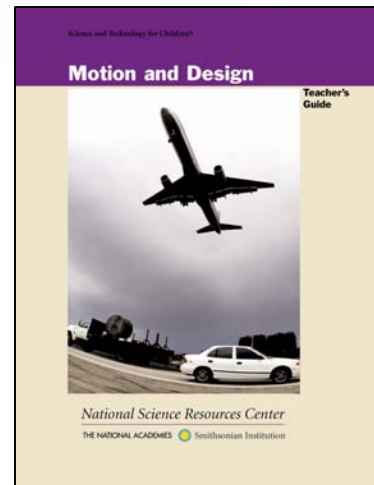
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Science and Technology Concepts™ Program

- Developed by the National Science Resources Center
- Module units cover topics in
 - life science
 - earth science
 - physical science
 - chemistry
- 20 modules in grades K–5
- 16 modules in grades 6–10



Science and Technology Concepts™ Pedagogy Program



- Based on research about how children learn with the learning cycle of **Focus, Explore, Reflect, and Apply**
- Developed by scientists and educators
- Rigorously field-tested with diverse populations
- Developmentally appropriate
- Uses proven standards-based principles and concepts

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