MWM Interactive

MATERIALS WORLD MODULES PROGRAM

Integrated Nano-STEM Education

Nano Literate Citizenship

Example: Progression of Learning & Applying SA/V Ratio

- **Grade 12:** SA/V Applications in Research, Industry, and Policy Making
- **Grade 8:** Ratios and Proportions: Effect of Size & Shape on 2D Perimeter/Area & 3D Area/Volume
- **Grade 6:** Characterize 3D Objects by Length, Area & Volume

Nanotechnology applications:
- Nano catalysis
- Energy generation
- Water filtration & treatment
- Target medicine delivery
- Consumer products & safety

Physical science applications:
- Dominant forces
- Surface tension
- Free fall & terminal speed
- Chemical reaction kinetics
- Human physiology

Life science applications:
- Animal metabolism
- Body thermoregulation
- Size & bone strength

Vertical Integration

Career & Professional Leadership

Post Graduate

Post Secondary/College

Elementary | Middle | High School

Nano Literate Leadership Development Through Lifelong Learning

Core Nano Concepts

- Measurement & Tools
- Size & Scale
- Surface Area-to-Volume (SA/V) Ratio
- Size-Dependent Forces
  - Structure & Properties
  - Self Assembly
  - Quantum Effects

Professional/Career Development

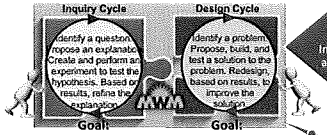
Vocational & Higher Ed

Precollege

Vertical (Lifelong Learning)

MWM Nano-STEM

Inquiry & Design

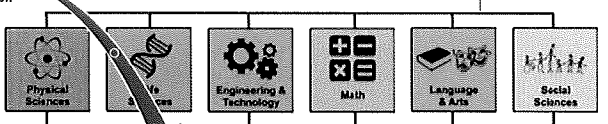


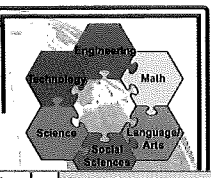
Use MWM's Inquiry and Design approach to fulfill

NGSS Science and Engineering Practices Standards

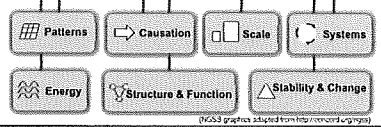
- Asking Question Defining Problems
- Using Models
- Conducting Investigations
- Analyzing Data
- Using Mathematics
- Constructing Explanations & Designing Solutions
- Arguing from Evidence
- Communicating Information

Integrated STEM





- Integrated with core disciplinary subjects and
- Connected to relevant Nano crosscutting concepts and
- Immersed in science & engineering design practices



(NGSS graphics adapted from http://ngsscrosscuttingconcepts.org)

Education | Horizontal (Integrated STEM)

Technology | Settings

Knowledge

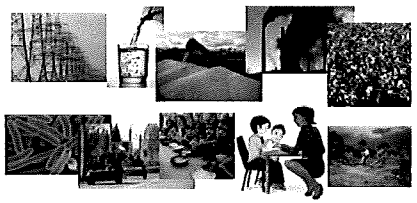
Learning Settings

Crosscutting Relevance

Societal & economic impact

Societal & Global Impact

Critical 21th Century Challenges



Nanotechnology—Driver for All Future Technologies & New Industries

- Work towards collective understanding of nanoscale science and technology
- Optimize our use of limited resources
- Minimize environmental hazards
- Improve healthcare delivery
- Make our lives more secure
- Raise our standard of living

Transport

Faster, cheaper, better with nanomaterials

Potential Impact of Nanotechnology


Resources
The future energy source


Healthcare
The future in Nanomedicine


Clean Water
Nano water filtration


Security
Nano sensor network


Computing
Quantum computing with nanoelectronics

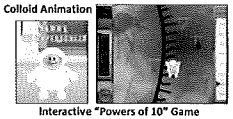
Anytime, Anywhere Learning

Interactive Cyber Mobile Platform

- Interactive, rich immersive multimedia
- Promote interest, motivation, and engagement
- Enhanced learning across subjects
- Seamless integration with classroom activities
- Rapid assessment feedback
- Increased flexibility and broad access
- Cyber platform for community collaboration


Interactive Gold Colloid Animation


Interactive Target Drug Delivery


Interactive "Powers of 10" Game

Personalized Learning

- Support structure for mastery of non-intuitive, difficult core nano concepts
- Customization of content delivery
- Organization of content in manageable chunks
- Ongoing assessment feedback
- Increased student responsibility for their own learning