



NANOTECHNOLOGY

Nanoscience — small particles with HUGE implications. Do your students understand the scientific principles behind this emerging field?

Students discover that physical and chemical properties of materials can depend on their size, investigate how nanoparticles can be made, and determine how to amplify small features at the nanoscale to the macroscopic scale. They are then challenged to design a working model of a nanoscale imaging apparatus or model a nanoscience phenomenon.

By incorporating everyday materials into science lessons, the Materials World Modules (MWM) program at Northwestern University has found the solution to getting students excited about learning science while helping teachers meet national and state education standards.

The modules are easy to organize and inexpensive to use. They can be incorporated into any science class because of the breadth of subjects covered in the Activity and Design Project sections. Each module is a supplemental science unit that takes 1-3 weeks of class time (approximately 10 hours) to complete.



Chemistry

- Attractive Forces ■ Catalysts ■ Colors and Light ■ Electrolyte Solutions ■ Rates of Reactions ■ Redox Reactions ■ Solutions, Colloids, and Suspensions ■ Physical and Chemical Properties ■ Atom Arrangements in Solids ■ Atomic Packing ■ Hydrogen Bonding ■ IR Spectroscopy ■ Surface Structure ■ Vibration of Molecules

Biology & Life Sciences

- Capillary Forces ■ Hydrophilic/Hydrophobic Reactions ■ Microscopy Techniques

Mathematics

- Orders of Magnitude ■ Calculating Surface-to-Volume Ratios ■ Geometry of Close-packed Structures ■ Calibration Plots ■ Metric System ■ Spring-constant Calculations

Physics & Physical Sciences

- Colors and Light ■ Capillary Forces ■ Diffraction ■ Electrostatics ■ Using Mass to Determine Spring Constant

Society

- Ethics and Impact of Uses of Nanotechnology

Language Arts

- Public Speaking ■ Word Derivations ■ Writing a Scientific Paper

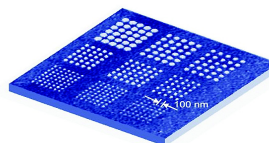
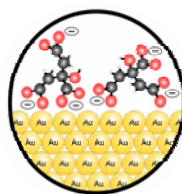
Module At-a-Glance:

Activities

- Changing the Properties of Materials by Changing Their Size
- Searching for Nanoscale Objects
- Nanopatterning with Lithography
- Amplifying the Nanoscale to the Macroscale

Design Project

- Designing a Nanoscale Imaging Apparatus
- Modeling a Nanoscience Phenomenon



MWM will give students an opportunity to understand the world around them in a way they have never experienced before. The modules promote an awareness of the roles science and technology play in society and guide students to take increased control of their work.

MWM is designed to improve STEM education

Science • Technology • Engineering • Math

Interdisciplinary
Integrates science & non-science subjects

Flexible
Can adapt to your teaching style, students' ability and class time

Hands-on
Contains activities that lead up to inquiry-centered design projects

Cutting-edge
Examines issues on the forefront of technological research

Particles absorb at different wavelengths depending on the size of particles

Materials World Modules

An Inquiry & Design Based STEM Education Program
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