



CERAMICS

Dinnerware, tile, sidewalks...radar-absorbing paint for military aircrafts. From the common to the extraordinary, ceramics are everywhere.

Students study the science of compacting ultra small ceramic particles. They evaluate the evolution of density and microstructure of ceramics as they are synthesized at high temperatures. They then use ceramics to make a voltage-protecting device.

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 run. 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.

Module At-a-Glance:

Activities

- Comparing Properties to Identify Materials
- Searching for Ceramics
- Exploring ZnO Powder
- Reducing Porosity and Slip Casting
- Sintering Ceramics
- Making a Varistor

Design Project

- Designing a Low-Clamping Voltage Suppressor
- Synthesizing a High-Temperature Superconductor



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

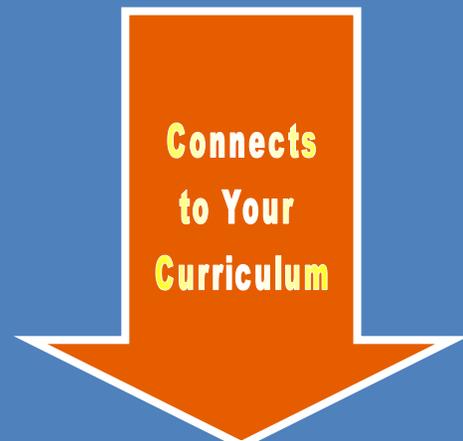
Interdisciplinary
Integrates science & non-science subjects

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

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

Cutting-edge
Introduces issues on the forefront of technological research

improve STEM education
Science • Technology • Engineering • Math



**Connects
to Your
Curriculum**

Chemistry

- Bonding ■ Charges ■ Chemical Formulas
 - Chemical Reactions ■ Colloids ■
- Compounds ■ Corrosion ■ Crystallinity
 - Diffusion ■ Electrolytes
- Intermolecular Forces ■ Ions ■ Melting Point ■ Molecules ■ Particle Size ■
- Physical Changes ■ Properties of Matter ■ Surface Energy ■ Surfactants

Biology & Life Sciences

- Cell Membranes ■ Respiration
- Structure and Function

Mathematics

- Algebraic equations ■ Binary System ■
- Geometry ■ Graphing ■ Measuring
- Percentages ■ Ratios ■ Surface Area

Physics & Physical Sciences

- Abrasion ■ Brittleness ■ Capillary Action ■
- Conductivity ■ Current ■ Density
 - Electric Circuits ■ Gravity
- Hardness ■ Heat ■ Insulators ■
- Magnetism ■ Metals ■ Ohm's Law
 - Optical Properties ■ Packing ■
- Density ■ Porosity ■ Pressure
 - Semiconductors ■ Strength
- Surface ■ Tension ■ Transistors ■
- UV Absorption ■ Voltage ■

Geology & Earth Science

- Clay Minerals ■ Minerals ■ Mining

Technical Education

- Building Materials ■ Engineered Materials

Language Arts

- Writing a report ■ Public speaking

Materials World Modules

An Inquiry & Design Based STEM Education Program

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