



SMART SENSORS

Microphones, interactive touch screens, light switches, and coin counters. Can you name other smart sensors?

Students investigate the behavior of pressure and heat sensitive piezoelectric films. They use these materials to make coin-counting and other smart sensing devices.

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.

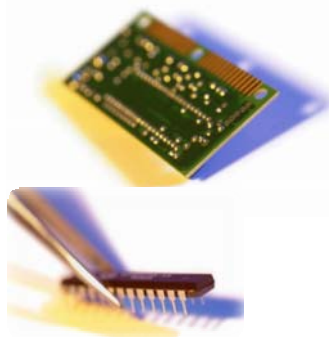
Module At-a-Glance:

Activities

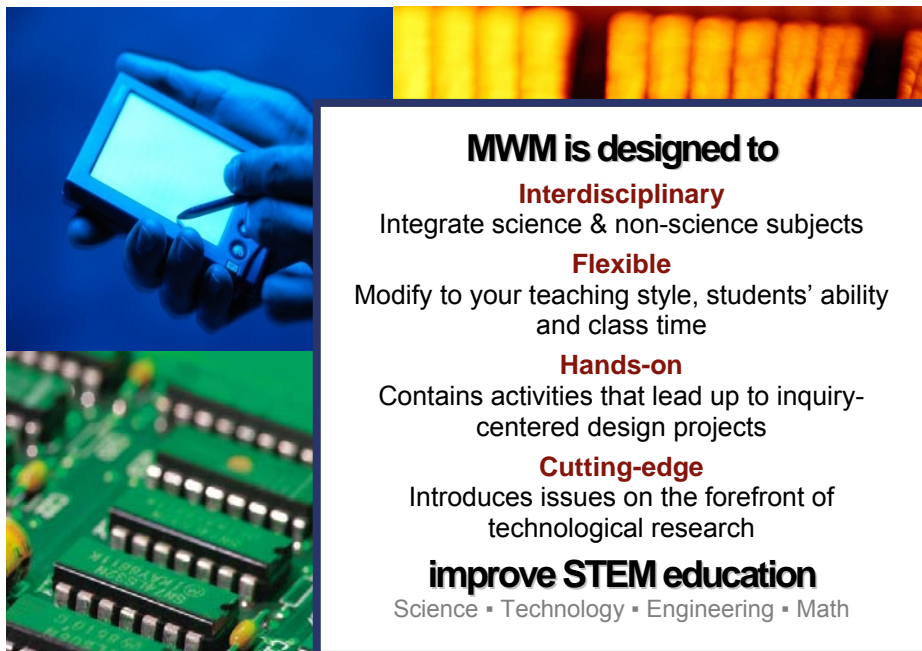
- Evading Motion Detection
- Taking a Tour of Some Sensors
- Making a Microphone
- Exploring the Piezo Effect
- Measuring Piezoelectric Response

Design Project

- Designing a Coin Counter
- Designing a New Sensor



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
Integrate 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

- Physical and Chemical Changes ■
- Chemical Reactions ■ Energy Absorbed or Released ■ Changing Properties ■
- Electronegativity ■ Structure of Atoms and Molecules ■ Ball and Stick Models ■ Electrons ■ Polarity and Dipoles ■
- Molecular Weight ■ Intermolecular Forces ■ Covalent Bonds ■ Conductivity ■
- Carbon Compounds ■ Polymerization ■ Organic Polymers

Biology & Life Sciences

- The Nervous System ■ Stimulus Response ■ Sense Organs ■
- Piezoelectric Properties of Bones and Other Tissues

Mathematics

- Algebraic equations ■ Graphing ■ Inverse Square Law

Physics & Physical Sciences

- Electromagnetic Forces ■ Mechanical Forces ■ Relationship Between Electricity and Magnetism ■ Interactions of Energy and Matter ■ Sound Waves ■ Light Waves ■ Wave Frequency ■ Crystallinity ■
- Charge Separation ■ Electric Potential (Voltage) ■ Electric Circuits ■ Induction ■ Displacement ■ Speed

Earth & Space Science

- Piezoelectric Crystal Such as Quartz ■ Seismology ■ Heat Absorption ■ Infrared Radiation

Technical Education

- Plastics ■ Generators ■ Motors

Language Arts

- Writing a report ■ Public speaking

Materials World Modules

An Inquiry & Design Based STEM Education Program

Northwestern University ■ www.materialsworldmodules.org

847-467-2489 ■ mwm@northwestern.edu

