



MANIPULATION OF LIGHT IN THE NANOWORLD

What makes opals so colorful? What can optical engineers learn from a peacock feather?

Students learn about how light interacts with matter at the nanoscale. They will fabricate, test, and evaluate their own photonic crystals.

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.

Module At-a-Glance:

Activities

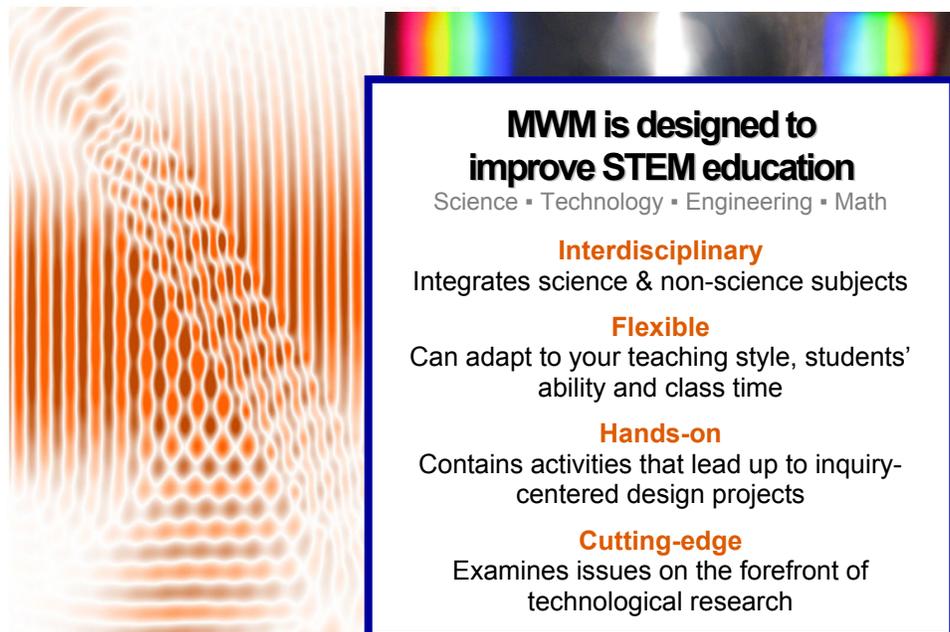
- Lights and Their Spectra
- Observing Diffraction
- Observing Interference
- Observing Iridescence

Design Project

- Fabricating Photonic Crystals



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.



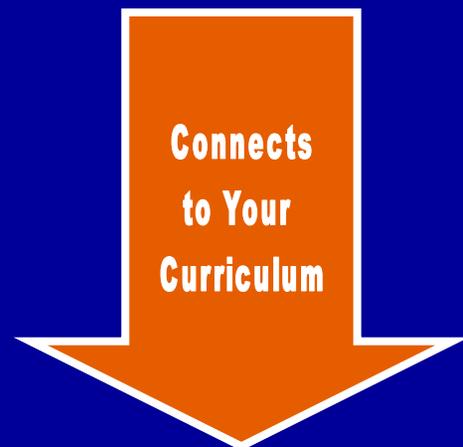
MWM is designed to improve STEM education
 Science ■ Technology ■ Engineering ■ Math

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



Connects
to Your
Curriculum

Chemistry

- Spectroscopy ■ Structure of Atoms ■ Pigments

Biology & Life Sciences

- Function of the Eye ■ Organisms' Response to Light ■ Resolution in Microscopes ■ Color and Iridescence in Nature, Adaptation

Mathematics

- Angles and Arcs ■ Measuring ■ Sine and Cosine ■ Dimension ■ Wave Functions

Physics & Physical Sciences

- Electromagnetic Spectrum ■ Energy Transfer ■ Color ■ Interaction of Energy and Matter ■ Waves Diffraction and Interference ■ Thin Films

Earth & Space Science

- Energy of the Sun ■ Extraterrestrial Spectroscopy ■ Solar Spectrum ■ Resolution in Telescopes ■ Crystalline Solids (Opals)

Language Arts

- Writing a Report ■ Public Speaking

Materials World Modules

An Inquiry & Design Based STEM Education Program
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