



# NANOPATTERNING

## Do you know how to make a nanoscale pattern?

Students learn multiple techniques for creating patterns at macro and nano scales. They use their knowledge to design ordered arrays (patterns) and analyze them by looking at the diffraction patterns.

By incorporating everyday materials into science lessons, the Materials World Modules (MWM) program at Northwestern University has found a 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**

- Self-Assembly
- Searching for Nanopatterns
- Diffraction Patterns
- Patterns and Scaling
- Double Replica Molding

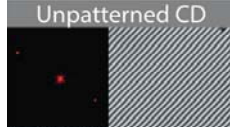
**Design Project**

- Designing a Pixel Array





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.

Unpatterned CD



Patterned CD





**MWM is designed to improve STEM education**

Science ■ Technology ■ Engineering ■ Math

**Interdisciplinary**

Integrates science & non-science subjects

**Flexible**


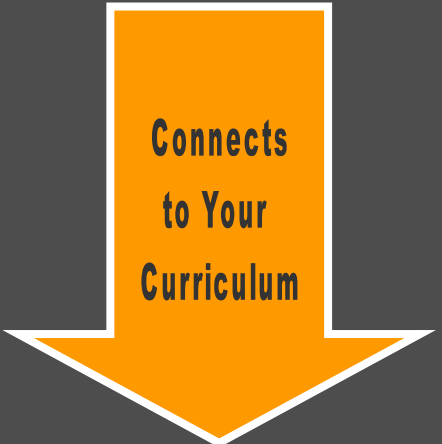
Can adapt to your teaching style, students' ability and class time

**Hands-on**

Contains activities that lead up to inquiry-centered design projects

**Cutting-edge**

Examines issues on the forefront of technological research

**Chemistry**

Self-Assembly ■ Surface Structure ■ Polymers ■ Intermolecular Forces ■ Molecular Packing ■ Solutions

**Biology & Life Sciences**

Self-Assembly ■ Organic Nanostructures ■ X-ray Diffraction

**Mathematics**

Measuring ■ Mapping ■ Patterning ■ Geometry of Close-Packed Structures ■ Orders of Magnitude ■ Inversion ■ Transforms

**Physics & Physical Sciences**

Colors and Light ■ Waves ■ Diffraction and Interference ■ Diffraction Patterns ■ Photonic Structures ■ Capillary Forces ■ Surface Energy

**Geology & Earth Science**

Patterning ■ Crystal Structures ■ Self-Assembly

**Technical Education**

Designing ■ Drafting ■ Materials ■ Fabrication Techniques ■ Molding and Templates

**Language Arts**

■ Writing a Report ■ Public Speaking

## Materials World Modules

An Inquiry & Design Based STEM Education Program  
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