Education Outreach

Rationale
- No regional tradition of high-tech industry.
- Poor state funding for K-12.
- Current testing climate hampers science education.

Goals
- Excite students in the K-12 arena, using inquiry based instruction, about science in everyday life.
- Engage and aid teachers, principals, and the community in improved science education.
- Expose undergraduate and graduate students to the fascinating world of materials science.

Demos at a primary school
Demos at Mall Day
Levitation in a High School
Outline:

I. K-12 Student and Community Programs
II. K-12 Teacher Programs
III. Undergraduate Efforts
IV. Graduate Education
V. Assessment

C-SPIN works at all levels to bring quality science education to the community.
K-5: SeeS

Sooner Elementary Engineering and Science

- Informal after-school learning experience for K-5 students
- Mentored by Physics and Engineering undergrads.

Accomplishments:

- Continued activities at elementary schools.
- Expanded to 4th and 5th graders with “Science Zone.”
- Starting activities at Community After-School Program (CASP) in Norman.
Middle school students learn what science truly is.

Teachers use inquiry-based experiments in the classroom.

Administrators shown value of inquiry-based teaching.

Grads learn to teach non-scientists, and the value of community involvement.

Arkansas effort led to NSF award winning video “Crisis in Education in America” describing GK-12 program.

10 fellows currently working with 19 science and math teachers.

Built partnership between Fullbright College, and Colleges of Education and Engineering.
Community Outreach

Museum Collaboration

- Grass roots outreach to areas with little access to high-tech learning activities
  - Oklahoma Children's Discovery Network: 3 urban, 2 rural museums
  - Arkansas Children's Discovery Centers: 3 urban, 3 rural museums
- Distributed hands-on museum exhibits to promote children's understanding of nanoscale science
- Training and support of museum staffs to enhance public interest in materials science and nanotechnology

Informal outreach:

- Elementary Classrooms
- High School Classes
- Engineering Days
- Mall exhibits
- Public talks
Boosting Engineering Science and Technology

- Using sports-like competition to inspire grade 7-12 students toward SMET careers.
- Emulates industrial team model
- Encourages under-represented groups (35F/54M in 14 teams)

C-SPIN contributions:
- Participate in the local administrative committee
- Game day volunteers
- Actively recruit new teams and hubs
- Actively work to develop a regional competition on the UA campus
Research Experience for Teachers

- **OU/UA 2005-7:** 12 science teachers (6HS/6MS) used CSPIN labs and expertise:
  - 4 of the HS teachers were involved in substantive research.
  - Rest involved in curriculum development and research.

Groups at OU & UA communicate with video conferencing, presenting work to one another.

Joint RET/REU meetings.

Curricular Materials Developed:

- **OU:** CSI learning modules on
  - Fingerprinting,
  - Counterfeiting,
  - Collision analysis
  - Serology,
  - Hair and fiber analysis
  - Soil analysis

- **UA:** Optics and Color
RET Research Examples

COOH pattern on CF self-assembled monolayer: 7 μm water drops in 80 μm pattern clearly seen.

SEM of SU-8 polymer extruded through AAO mask.

SEM of Nickel dots for tribology collaboration with UA.
Nanotechnology Digital Library

Focus:
To create a comprehensive, peer-reviewed digital collection of high-quality educational materials on nanotechnology for grades 6-12.

Rationale:
- Absence of teacher preparation in concepts of nanotechnology
- Few resources in nanotech for middle/high school teachers
- Need peer review in selection and evaluation of materials
- Need to coordinate efforts among existing digital libraries

Existing web-based resource
Communities for Physics/Astronomy Digital Resources in Education - NSDL project

Link on ComPADRE for this initiative

Share all materials directly with Merlot
Comprehensive web-based educational clearinghouse covering 15 disciplines
Undergraduates

NSF-REU statistics:
- OU/UA: 50 students in CSPIN labs.
  - 12% Female
  - 32% Minority

C-SPIN provides
- Mentors and labs
- RET participation
- Industrial tours
- 1-2 Stipends

Two REU students manipulate a sample in ultra-high vacuum.
Advanced Education:

- Undergraduate Courses: NanoLab developed at OU with NSF-NUE funding.
- Graduate Courses: Continued UA Nanotechnology Course.
- STUDIO: Science and Technology Undergraduates Developing Interdisciplinary Research: 1.1M$ grant.
- In-reach:
  - Internet II shared seminars.
  - Research Exchange hosted by grads.

An Internet II shared class.

NanoLab students take a break.
Assessment of Programs

- Participating in NSF organized committee of MRSEC Outreach coordinators to assess outreach tools.
- Assessment covers K-12, undergraduates, graduates, teachers, and laypersons with emphasis on reaching under-represented groups that include minorities, women, and the disabled.
- Formed a partnership with Cornell University’s College of Human Ecology, Department of Policy Analysis and Management as a trial subject in their ‘Systems Evaluation Protocol for Assessing and Improving STEM Education Evaluation’ program.
Outreach Summary

K-12
- KIDS outreach program
- BEST robotics program
- Classroom visits and lab tours
- SeeS program

Teachers
- Research experience in C-SPIN labs
- Teaching resources developed with C-SPIN personnel
- Workshops for teachers.
- Nanotechnology Digital Library

Undergraduates
- Research experience
- Courses

Graduate students
- Research connections between and within campuses
- Teaching experience in local schools

Resources
- Museum kits
- Development and implementation of K-12 science lessons