

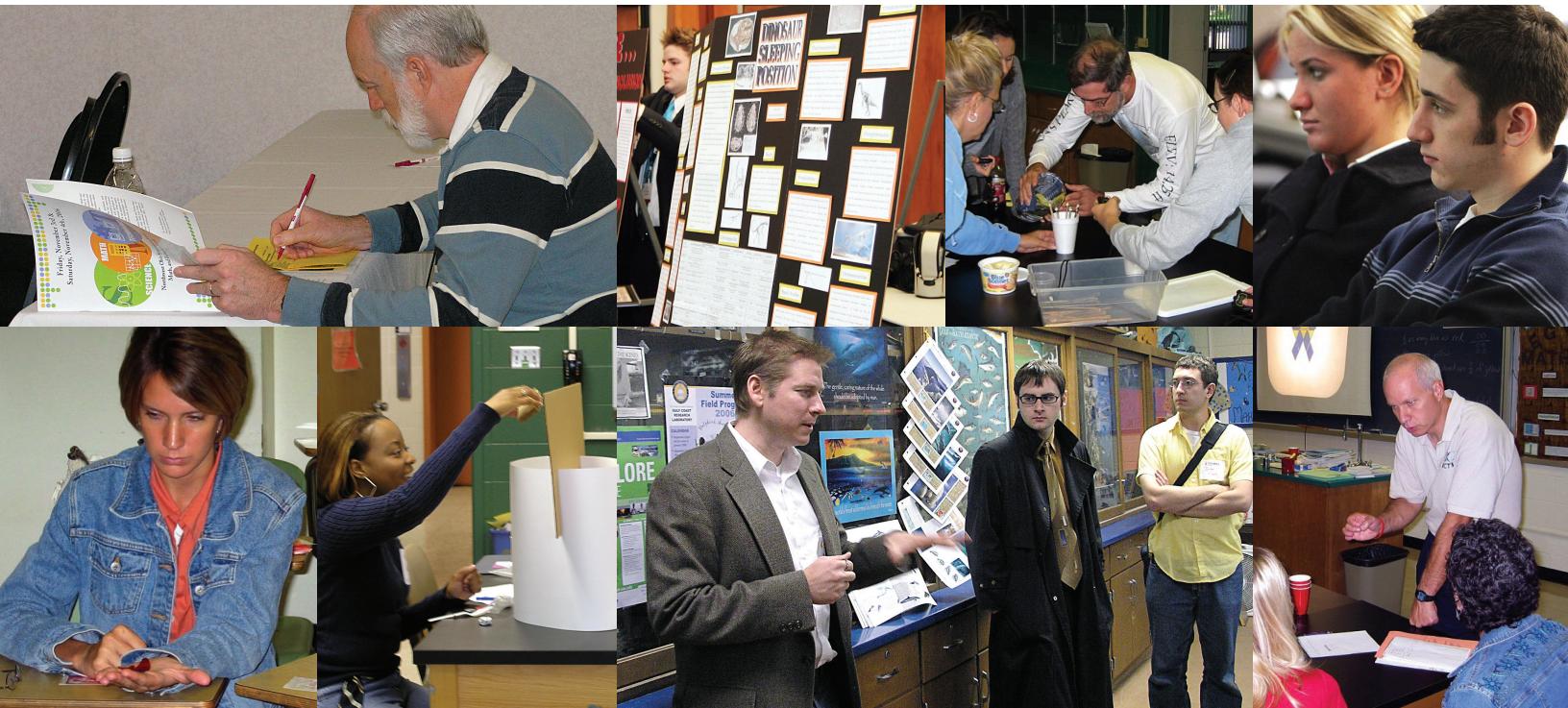
**Northwest Ohio Center of Excellence  
in Science and Mathematics Education**

coordinating partners

**BGSU**  
Bowling Green State University

**OWENS**  
COMMUNITY COLLEGE

**THE UNIVERSITY OF  
TOLEDO**



# 2006

**NORTHWEST OHIO CENTER OF EXCELLENCE IN SCIENCE AND  
MATHEMATICS EDUCATION (NWO) ANNUAL REPORT**

[www.nwocenter.org](http://www.nwocenter.org)

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## NWO Mission

The NWO Center's unified mission is to improve science, technology, engineering, and mathematics (STEM) education for people of all ages.

## NWO Vision

NWO aims to advance science, technology, engineering, and mathematics (STEM) education for people of all ages. Our purpose is (a) to work with community partners to generate new knowledge about the science of teaching and learning, (b) apply this knowledge by developing the expertise of K-12 educators and higher education faculty, (c) increase public support for, and understanding of, the STEM subject areas, and (d) to stimulate the interest of young people, especially those in underrepresented groups, in these rewarding fields of study and career opportunities.

## Acknowledgments

We would like to acknowledge the critical support we have received from the Ohio Board of Regents, the Ohio Department of Education, our higher education institutions, and our local school districts. We would especially like to acknowledge the contributions of the many members of our NWO team. The dedication, passion, competence, and subsequent contributions of this team are far reaching.

## NWO 2006 Annual Report ~ An Introduction

In this report, we provide both quantitative and qualitative measures documenting the effectiveness of our collective activities and accomplishments. In our FY 2005 report, we set an annual goal for 2006 to focus on assessment, evaluation, and dissemination of our work. As such, we believe this report, and the accompanying report from the University of Cincinnati Evaluation Services Center (UCESC), goes a long way in unfolding the story of how NWO impacts science and mathematics education in our region and state. Our story is impressive, yet we continue to aim to improve our ability to gather and analyze additional data in a systematic way to further document and disseminate the impact of our efforts. This report details the many activities NWO orchestrates. The accompanying NWO Evaluation Report (Appendix L) provides an external analysis of impact of our work. Because of the length of each report we will not repeat the information found in the Evaluation Report, but will reference it throughout this document.



The Northwest Ohio Center of Excellence in Science and Mathematics Education (NWO) has built a regional identity. Over the past four years, we have worked to unify regional efforts to develop and accomplish the above NWO mission and vision (NWO Center Brochure, Appendix A). NWO has joined together two separate science and mathematics education centers – SciMaTEC, at the University of Toledo (UT), and COSMOS, a center established at Bowling Green State University (BGSU) as a result of the first round of funding to NWO. Since the inception of this agreement, many



SciMaTEC and COSMOS activities have been re-established and expanded as Center activities. We have jointly invested both time and financial resources to design, develop, and disseminate NWO (rather than university/college-specific) public relations and advertising materials to further demonstrate our commitment to a unified center approach. The new structure is working. In addition, a joint NWO Advisory Board was established to guide the regional efforts. As a result, Owens Community College (OCC), Lourdes College (LC), The University of Findlay (UF), and a number of community and business organizations such as the Toledo Zoo and COSI-Toledo have become active and passionate NWO collaborative partners. The Center has worked to gain the respect and sustained collaboration from our partner schools, including four high-needs districts (Fremont City, Fostoria Community, Lima City, and Toledo Public) as well as smaller districts and county educational service centers (ESCs) including Bowling Green City, Maumee City, Perrysburg, Springfield Local, Hancock County ESC, and Wood County ESC, among others.

NWO has a clear and specific focus on providing K-16+ professional development in science and mathematics, both in content and pedagogy, and developing new knowledge in the teaching and learning of science and mathematics. As a regional center, we aim to provide services appropriate and meaningful for all individuals and groups interested in joining our professional community. Often, non "high-needs" districts or individual teachers get left out of state-level professional development plans, yet our regional needs assessment indicated a strong desire and need for high-quality professional development in science and mathematics across the 20 county area, especially in rural communities. As such, we host meetings and events that are open to all pre-service and in-service teachers, higher education faculty, and other community partners across the region. In total, 897 pre-service teachers, in-service teachers, and higher education faculty actively participated in at least one Center activity during the 2005-06 academic year.



We are equally committed to identifying high-needs partners (defined by low student pass rates on Ohio achievement tests, high poverty level, or lower percentages of employed highly qualified teachers within the district) that desire high-quality, rigorous, and sustained professional development. Our approach then is two-tiered: to provide high-quality professional development opportunities for interested individuals and smaller non-high-needs school groups, and also to provide systemic professional development opportunities to a few targeted high-needs groups that will result in changes at the institutional level (school, district, college, university).

Our diverse efforts, described in this report, fall into four categories:

- In-service professional development
- Pre-service professional development
- Faculty development and involvement
- Affiliated projects



# NWO GOALS



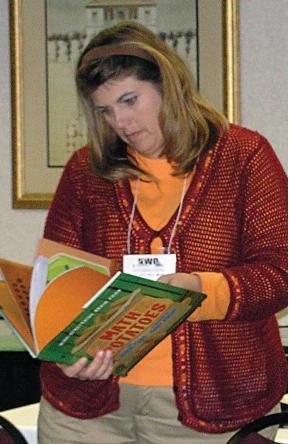
**Together, NWO activities help us attain the following goals:**

1. Increase the capacity of urban and other at-risk districts to enhance student achievement in science and mathematics through partnerships among universities, K-12 schools, and the Ohio Resource Center.
2. Increase the recruitment of pre-service and retention of in-service teachers of science and mathematics.
3. Improve in-service teacher preparation and faculty development in science and mathematics education.
4. Strengthen coordination/communication among college faculties (teacher education, sciences, and mathematics) and with funding agencies to improve the sustainability of the Center.
5. Establish ongoing collaboration among institutions of higher education, school districts, professional development centers, and the Ohio Resource Center to identify and solve root barriers to science and mathematics achievement.

These goals will be reached by enacting the detailed collaborative activities that follow.



# ACTIVITIES AND ACCOMPLISHMENTS



## In-Service Teacher Professional Development

### *Northwest Ohio Symposium on Science, Mathematics, and Technology Teaching*

For the last three years, the Northwest Ohio Symposium on Science, Mathematics, and Technology Teaching (NWO Symposium) has brought together hundreds of participants to exchange effective strategies for teaching science and mathematics. This popular event has provided the Center with huge visibility in the community, attracting teachers to our long-term professional development opportunities and giving all participants resources and ideas they can use in their classroom or setting. Because of our growing success, the 2005 Symposium was expanded to a two-day format, allowing us to focus on higher education professional development on day one and K-12 on day two. This NWO Symposium was attended by 485 participants (pre-service and in-service teachers, faculty, and NWO staff). The 2005 NWO Symposium program is included in Appendix B. The sessions were rated as "very beneficial" and participants were "highly likely" to return the following year. NWO will continue to expand this showcase event and adapt it to reflect emerging needs of our partners. In addition, as the profile of this event continues to grow, we continue to attract more prospective presenters; we can be increasingly selective in our presentations and offer a symposium that highlights the best in science and mathematics professional development.



### *COSMOS Inquiry in Science and Mathematics Education Series*

Sustained professional development is also offered by NWO through its academic year COSMOS Inquiry Series. The Inquiry Series has become a highly popular professional development opportunity in the region. The 2005-06 series of workshops followed the thread of inquiry through many aspects of teaching (e.g., questioning, lesson planning, assessment) and provided teachers with the chance to discuss the barriers that impede implementing inquiry-based instruction in their classroom in small-group settings (study groups) as part of each session (Inquiry Series Brochure, Appendix C). The Series started with a Blast-Off in the fall during which we featured a nationally recognized speaker in science/mathematics teaching, and then several NWO partners showcased high-quality inquiry-based lessons. Monthly Inquiry Series meetings featured interactive presentations and content- and grade-specific learning communities (or action groups) facilitated by K-12 teacher leaders. The series concluded with a Summit in late spring during which NWO partners shared lessons they developed during the year or research they conducted on student learning in science and mathematics. Monthly Inquiry Series and Action Groups were attended by an average of 75 participants/month during the 2005-06 academic year representing pre-service teachers, in-service teachers, MAT graduate students, GK-12 graduate fellows, school administrators, and higher education faculty. Sessions were highly rated by participants as a great support network, providing assistance in developing lesson/curriculum plans, learning how to go about inquiry in the classroom, and gaining awareness and preparedness to help students reach the Ohio standards and succeed on OGT/achievement testing. NWO will continue to expand this sustained professional development and adapt it to reflect emerging needs of our partners. This year (2006-07), the series is now considered an NWO event, as NWO partners from around the region are more involved than in years past and other NWO project participants are attending the NWO Inquiry Series. The Inquiry Series is both open to any teacher, faculty member, or school community partner in the region and participants can opt to attend only one or all Inquiry Series events. Tuition Scholarships are available through a cost share of BGSU Graduate College for up to 30 students who wish to actively participate in the entire series for two hours of graduate credit. The Inquiry Series is also a monthly platform for the affiliated NWO projects to bring together their project participants for project-specific professional development (action groups) or general professional development (feature presentations).



## *MAT Programs*

Currently, COSMOS offers tuition scholarships to study both content and pedagogy through BGSU's Master of Arts in Teaching (MAT) programs. The coursework for these programs has been developed in part by COSMOS faculty to blend content consistent with the Ohio Standards with research-based pedagogical techniques. The physics MAT program offers a three-year-long professional development experience and thus creates communities of teachers that persist even after they complete the program. In 2005-06, 15 students received full tuition MAT scholarships (six mathematics, eight physics, and one biology education). Each student received approximately \$5,300 in support from COSMOS and BGSU graduate college matching funds. The MAT programs graduate approximately six students each year. COSMOS will work to expand the MAT offerings at BGSU to include revised coursework in biology, chemistry, and geology, and to explore the creation of an integrated science MAT program geared towards middle-grades teachers.

## *NWO K-12 Larabee Mini-Grants and K-16 Professional Development Grants*

NWO sponsors \$2,000 mini-grants for school/university partnerships that aim to promote the NWO vision and goals. The grants are named after a master science and mathematics teacher in the region who tragically lost his life in 2005. The NWO Larabee grant application process information and documents are found at the NWO website (<http://www.nwocenter.org>). In 2005, a K-12 mini-grant was awarded to Van Buren Elementary School for \$2,000 to initiate a cross-curricular, inquiry-based Community Garden Project. Project directors (Van Buren teachers) presented the results of their high-quality work at the NWO Summit in April 2006. Their final project report is available upon request.

Another K-12 mini-grant was awarded to Matt Partin for \$1,400 for the development of a Virtual Bio-Tour, a viable option to bring university science faculty and their labs in contact with school children and teachers with absolutely no cost to the districts. Mr. Partin presented the results of his work at the NWO Summit in April 2006.

A K-16 professional development grant was awarded to Deb Shelt for \$500 to host the annual winter meeting of the Greater Toledo Council of Teachers of Mathematics, a meeting designed to provide in-service and pre-service teachers with information about teaching using a constructivist approach while preparing students for "high-stakes" tests.

Dr. Dan Brahier was awarded \$603 to help defray the cost to students participating in a Praxis II mathematics preparation workshop. This preparation event was devoted to a topical mix of mathematical content and tips for achieving success on the test.





## Pre-Service Teacher Preparation and Recruiting

### *Northwest Ohio Future Teacher Conference*

The annual Future Teacher Conference (FTC) provided pre-service teachers with the opportunity to discuss issues related to education as a career choice with in-service teachers and faculty. This Conference is unique in that the pre-service teachers themselves organize the event. This event also serves as a good recruiting strategy. Owens Community College students, as well as other undergraduate students in the region, who are considering a career in education are recruited to attend. The 2005 annual Future Teacher Conference was attended by over 200 pre-service teachers, in addition to the 37 presenters, 9 educational organizations, and 11 vendors that participated. We will continue to expand the organizations involved in this event and use it to attract more science and mathematics students into the teaching profession as well as to ensure that the next generation of science and mathematics teachers is well versed in inquiry-based instruction.

### *Ohio Junior Science and Humanities Symposium*

The Ohio Junior Science and Humanities Symposium brings the best and brightest talents from Ohio high schools together for a competition to highlight and judge the quality of their research projects in the sciences and humanities. We believe this event is an excellent opportunity for the recruitment of the next generation of teachers. We will continue to expand the organizations involved in this event and use it to recruit students into the fields of STEM and science and mathematics education. This event is co-sponsored by NWO and a grant from the US army, navy and air force.

### *BG/UT SECO and CTM*

BG-UT Science Education Council of Ohio / BG-UT Council of Teachers of Mathematics undergraduate professional organizations hosted monthly activities to promote active involvement in the profession prior to graduation. Approximately 80 undergraduate students attended each event. We will continue to expand this organization and use it to recruit and retain students into the fields of science and mathematics education.

### *Praxis II Tutoring*

Praxis II preparation workshops and tutoring sessions were hosted by science and mathematics faculty who themselves have taken the Praxis content tests. A Praxis II tutorial event in mathematics education was held on February 18, 2006, at BGSU. A total of 5.5 hours was devoted to a topical mix of mathematical content and tips for achieving success on the test. Several Praxis II group and individual tutorial sessions in science were held from January through March. We will expand the tutoring offerings to include a preparation workshop for the sciences as well as the mathematics education majors.

## Faculty Development and Involvement

### *Teacher Education Course Redesign/Development*

A critical component of pre-service and in-service teachers' professional development is their content and pedagogy coursework. Center funds are earmarked for the development and modification of teacher preparation coursework. Two new university courses were developed and piloted by BGSU faculty this year (an online Probability and Statistics course for mathematics MAT students and an Introduction to Secondary Mathematics Topics for undergraduate AYA mathematics education students). Both of these courses are now regularly offered courses for teacher education students. We will continue to infuse best practices into these courses so that pre-service teachers do not face a mismatch between the teaching advocated in their education courses and the teaching methods employed in their science and mathematics content courses. The developed syllabi and supporting documents for these two new courses are found in Appendix D.



### *Research Learning Community*

In this COSMOS Research Learning Community, faculty read and discuss top-tier research on science and mathematics education, present research talks to design and develop new projects, discuss work in progress, or share the findings from a completed study. Importantly, presenters receive feedback from their peers and discuss new potential collaborative research project ideas. An average of 25 higher education faculty and center staff representing seven departments and three colleges participated in the COSMOS Research Learning Community during the 2005–06 academic year. As a result, approximately 10 new collaborative research projects were launched during this time. This Research Learning Community was highly rated by faculty participants for establishing a sense of community among other researchers and teachers across the university, developing new research methodologies and refining research designs, gaining a background in science education, and enriching interdisciplinary awareness. Because of the overt excitement emerging from this group, SciMaTEC will be offering a similar program on their campus Fall 2006 (Faculty Associate Program) and joint NWO research community meetings are on the horizon.



## *Dialogues Across College Barriers*

UT's Science, Mathematics, and Technology Education Center (SciMaTEC), in conjunction with NWO, sponsored a luncheon seminar series, Dialogues Across College Barriers, designed for faculty and staff from four of the key NWO higher education institution partners: BGSU, UT, OCC, and LC. The purpose of Dialogues Across College Barriers was to facilitate the sharing and presentation of research in the science of teaching and in science and mathematics education between both College of Education and the College of Arts and Sciences faculty across these institutions. The seminar series included two fall and two spring lectures. Faculty speakers from various institutions were featured at these seminars. Listed below are the speakers' presentation titles and institutional affiliations, as well as the dates of the seminars:

- "Weaving a TAPESTRY Among Higher Education Faculty: The Aftermath of a Successful K-12 Science Education Reform Project," Dr. Jodi Haney, BGSU, September 9, 2005.
- "The Shared Legacy of the Undergraduate Professoriate," Dr. Bruce Busby, OCC, October 21, 2005.
- "Lesson Study: Improving Teaching and Learning One Lesson at a Time" and "Getting Started: Doing a Lesson Study," Dr. Bill Cerbin, University of Wisconsin, February 24, 2006.
- "Assessment," Dr. Mark Templin, UT, March 31, 2006.

The Dialogues sessions were rated as highly worthwhile and valuable by university faculty as noted by the UCESC Evaluation Report.

## *Learning Sciences PhD Program*

BGSU is developing a proposal for a Learning Sciences (LSC) PhD program. The interdisciplinary program brings together faculty from multiple departments/units in the Colleges of Education and Arts and Sciences providing expertise in education, content, and learning. The PhD program focuses on preparing new faculty with a research focus on how people learn science and mathematics in a post-secondary setting. This unique program is timely, as faculty positions in science and mathematics education exist, both in the College of Education and the College of Arts and Sciences, and often these positions go unfilled as the demand has far exceeded the supply. The LSC program is designed to meet the needs of this projected shortfall by preparing faculty who can work across disciplines to meet the new challenges of the 21st century. COSMOS faculty are highly involved in the development of this new program and the current COSMOS director is leading the process. The preliminary document was reviewed by nine Ohio institutions and was modified slightly in light of the recommendations and questions raised. The full proposal will be submitted to the Ohio Board of Regents once university approval is attained. We foresee high levels of collaboration between this doctoral program and COSMOS.



## Faculty Participants

Many faculty from BGSU, UT, and OCC have been involved in some capacity, including the professional development seminars, COSMOS Study Groups and Research Learning Community, UT Dialogues Across College Barriers, NWO Symposium, Ohio Junior Science and Humanities Symposium, and Learning Sciences PhD program committee.

### Key Arts and Science faculty include:

Van Hook, Laird	BGSU - Physics & Astronomy
Heddle, Myers	BGSU - Environmental Programs
Moses, Carothers, Meehl	BGSU - Mathematics
Panter, Elkins	BGSU - Geology
Midden	BGSU - Chemistry
Partin, Underwood, Sirum	BGSU - Biological Sciences
Gromko	BGSU - Vice Provost
Bullerjahn, Krompak, Roehrs, Schmoekel, Salahat	OCC - A & S faculty
Busby, Perry, Bazer, Way	OCC - Biology/ A & S Administrators
Duran, DuBrul, Leady, Creutz, Leaman, Quinn	UT - Biological Sciences
Bjorkman, Bopp, Lee	UT - Physics & Astronomy
Spongberg, Czajkowski	UT - EEES
Coleman, Escobar, Berhan	UT - Engineering
Funk, Jorgensen, Klingberg	UT - Chemistry
White	UT - Mathematics
Ford, Williams	UT - Pharmacy
Czarcinski, Molitor, Wise	LC - A & S faculty

### College of Education faculty include:

Haney	BGSU – Science and Environmental Education
Ballone-Duran, Huziak-Clark	BGSU - Science Education
Brahier, Emerine, Gallagher	BGSU - Mathematics Education
Pindiprolu	UT - Early Childhood, Physical and Special Education
Beltyukova, Fox	UT - Research and Measurement



## Faculty Refereed Publications

*Articles by NWO core faculty published in 2005 that are directly related to NWO/COSMOS*

Moran, T., & Van Hook, S. J. (2006). Using student peer review of experiment reports in an undergraduate physics class. *Journal of College Science Teaching*, 36(1). (See Appendix E.)

*Articles by NWO core faculty submitted in 2005 that are directly related to COSMOS:*

Van Hook, S. J., & Huziak, T. *Lift, squeeze, stretch and twist: Developing kindergartners' understanding of energy using inquiry-based instruction.* Manuscript submitted April 2006 to the Journal of Elementary Science Education. (See Appendix E.)

*Articles by NWO core faculty submitted in 2005 that are NOT directly related to COSMOS/NWO:*

Van Hook, S. J., Lark, A., Hodges, J., Celebrazze, E., & Channels, L. *Playground physics: Determining the moment of inertia of a merry-go-round.* Manuscript submitted to and accepted by The Physics Teacher (to be published in 2007).

Duran, E., Ballone-Duran, L., & Haney, J. J. *Project ASTER III: A model for professional development integrating science museum exhibits with state and national science education content standards.* Manuscript submitted November 2006 to the Curator.

Haney, J. J., Keil, C. P., & Zoffel, J. *From problem solving to taking action: An "EXCITing" problem-based learning model for middle grades teachers.* Manuscript submitted October 2006 to the Ohio Middle School Journal.

Haney, J. J., Keil, C. P., Zoffel, J., & Wang, J. *Enhancing teachers' beliefs and practices through the implementation of problem-based learning focused on locally pertinent environmental health science issues.* Manuscript submitted October 2006 to The Journal of Environmental Education.

Keil, C. P., Haney, J. J., & Zoffel, J. *Improvements in science process skills using environmental health science problem based learning curricula.* Manuscript submitted October 2006 to The Journal of Environmental Education.

Duran, E., Ballone-Duran, L., Haney, J. J., & Beltyukova, S. *Project ASTER III: The impact of a professional development program integrating informal science education on early childhood teachers' self-efficacy and beliefs about inquiry-based science teaching.* Manuscript submitted September 2006 to The Journal of Teacher Education.

*Articles by NWO core faculty published in 2005 that are NOT directly related to NWO/COSMOS:*

- Van Hook, S. J. (2006). Battle of the merry-go-rounds: A torque and angular momentum demonstration. *The Physics Teacher*, 44, 304-307.
- Czerniak, C. M., Beltyukova, S., Struble, J., Haney, J. J., & Lumpe, A. T. (2005). Do you see what I see? The relationship between a professional development model and student achievement. In R. E. Yager (Ed.), *Exemplary science in grades 5-8: Standards-based success stories*. Arlington, VA: NSTA Press.
- Duran, E., & Ballone, L. (2005). Project ASTER: A model staff development program and its impact on early childhood teachers' self-efficacy. *Journal of Elementary Science Education*, 17(2), 1-12.

## Faculty Refereed Presentations

*Presentations directly related to NWO/COSMOS:*

- Duran, E., Ballone-Duran, L., Haney, J. J., & Beltyukova, S. (2006, April). *Project ASTER III: The impact of a professional development program integrating informal science education on early childhood teachers' self-efficacy and beliefs about inquiry-based science teaching*. Paper presented at the National Association for Research in Science Teaching international convention, San Francisco.

- Van Hook, S. J., & Huziak, T. (2006, January). *Development of mental models of energy by kindergarten students*. Paper presented at the Association for Science Teacher Education (ASTE) conference.

*Presentations not directly related to NWO/COSMOS:*

- Huziak, T., Ballone-Duran, L., Van Hook, S. J., & Nurnberger-Haag, J. (2006, March). *The impact of the Partnership for Reform through Inquiry in Science and Mathematics (PRISM) on teacher and scientist notions of inquiry*. Paper presented at the National Association for Research in Science Teaching (NARST) conference.



Huziak, T., Van Hook, S., Nurnberger-Haag, J., & Ballone-Duran, L. (2006, January). *The impact of a science and mathematics reform program: Partnerships for Reform through Inquiry in Science and Mathematics (PRISM) program on building collaboration and improving pedagogy*. Paper presented at the Association for Science Teacher Education (ASTE) conference.

Haney, J. J., Keil, C. P., Zoffel, J., Moreno, N. P., Tharp, B. Z., Roberts, J. K., Hardy, V., Acharya, C., & Waishwell, L. (2006, January 9). *Making the case for the integrated curriculum through the lens of environmental health science*. Paper presented at the 4th annual Hawaii International Conference on Education, Honolulu, HI.

Zoffel, J., Haney, J. J., & Keil, C. P. (2006, January 8). *Project EXCITE: Environmental Health Science Explorations through Cross-Disciplinary and Investigative Team Experiences: Successes and challenges related to using problem-based and integrated curricula with middle grades students*. Research poster presented at the 4th annual Hawaii International Conference on Education, Honolulu, HI.

Duran, E., & Ballone, L. (2005). *Project ASTER: A model staff development program and its impact on early childhood teachers' self-efficacy*. Paper presented at the Hawaii International Conference on Education, Honolulu, HI.

## Non-Refereed Presentations and Workshops Related to COSMOS/NWO

Van Hook, S., & Huziak, T. (2006, July). *Enhancing early science instruction with physics songs*. American Association of Physics Teachers (AAPT).

Shafer, M., & Haney, J. J. (2006, February 18). *Hmmm...I wonder what will happen if I try THIS? Strategies to guide students during the experimental process*. Hands-on workshop presented at the annual Science Educators Council of Ohio (SECO) convention, Akron, OH.

Duran, E., & Haney, J. (2005, September). *The NW Ohio Center of Excellence: We're on the move!* Presentation at the Symposium on Mathematics and Science Teaching and Learning, Akron, OH.

## K-12 Outreach Activities and Services

Several NWO team members were highly involved in a variety of outreach activities in local schools, educational service centers, and informal science centers. Over a thousand teachers, students, administrators, and community members were directly impacted by these voluntary outreach endeavors. Appendix F is a chart detailing the presenter, topic, and audience for each outreach activity.



## Affiliated Projects:

### NWO TEAMS (*Teachers Enhancing Achievement in Mathematics and Science*)

NWO TEAMS is a collaborative partnership between three high-needs school districts (Toledo Public Schools, Lima City Schools, and Fostoria Community Schools), suburban and rural school districts, and the Colleges of Arts and Sciences and Education at UT and BGSU. The recruiting brochure is included in Appendix G. This Math and Science Partnership (MSP) grant aims to increase the academic achievement of students of science and mathematics by enhancing the content knowledge and teaching skills of classroom teachers. Specifically, the program provides intensive, sustained professional development. Over 60 teachers grades 3-6 participated in a two week Summer Institute held June 26-July 7, 2006 (50 contact hours). They will participate in 2006-07 Academic Year Contact Study Groups as a part of the aforementioned Inquiry Series (30 contact hours) and a one-week 2007 Summer Institute (40 contact hours). The quarterly evaluation reports are available upon request.

### *TeachOhio*

NWO TeachOhio is an initiative that strongly reflected recruitment of teachers into mathematics and science, involving grant funds from the Ohio Department of Education specifically for this purpose. The recruiting brochure is included in Appendix H. It is a collaborative partnership between BGSU, UT, OCC, and regional school districts. In particular for the 2006–07 school year, four high-needs districts are key partners (Toledo Public Schools, Lima City Schools, Fostoria Community Schools, and Fremont City Schools). BGSU took the lead on this project with UT and OCC contributing to this project by leading monthly cohort meetings, serving on the advisory board, and assisting in planning recruitment of science and mathematics teachers via the development of future teacher clubs in area schools. The purpose of the TeachOhio grant is to increase the pool of highly qualified 7th–12th grade science and mathematics teachers in Ohio through alternative licensure. The NWO TeachOhio program seeks to deepen this goal by having the cohort not only obtain licensure, but also earn a master's degree in curriculum and teaching and receive on-going support and professional development via academic year participation in the NWO Inquiry Series and cohort meetings. The recruitment for this program began in 2006 with more than 1,000 people with science and/or mathematics backgrounds receiving brochures and many others reading about this opportunity through newspaper advertisements and an announcement in a teachers' union newsletter. Brochures describing the TeachOhio initiative were distributed at Center-sponsored Inquiry Series sessions, through Center-affiliated projects, and sent to Hancock County's substitute teachers, BGSU's mathematics and science alumni, and faculty in the mathematics and science departments at BGSU. The director and/or program





manager held six informational meetings and met personally with individuals interested in the program. The 2006–08 NWO TeachOhio cohort of 16 people are currently pursuing licensure and a master's degree. Since June 2006, when the cohort was established, eight of these people are now teaching science on alternative licensure in the four high needs districts previously listed. Four other recruits are taking additional content coursework during academic year 2006 to obtain licensure and plan to begin teaching in Fall 2007 (two mathematics and two science). The other four members of the cohort are already licensed Ohio teachers, but through the TeachOhio program have found an avenue for obtaining a 7-12th grade science license. The mid-term report is available upon request.

### *PRISM*

This G-K12 NSF grant, Partnership for Reform through Inquiry in Science and Mathematics (<http://prism.bgsu.edu/>), develops co-teaching partnerships between K-12 classroom teachers and science and mathematics graduate students. PRISM teachers and graduate student fellows regularly attend the monthly COSMOS/NWO Inquiry Series events and collaboratively present best-practice lessons at the Blast-Off, Summit, and NWO Symposium. The final evaluation report is available upon request.

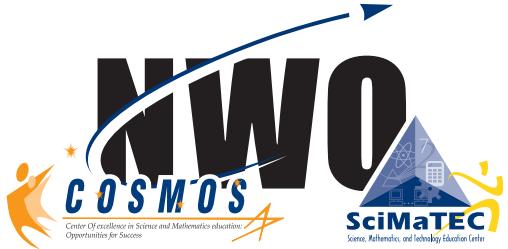
### *COSMOS Math Lunch Time Instruction*

COSMOS Math Lunch Time Instruction was a service contracted by the BGSU GearUp grant project (awarded by the U.S. Department of Education). This COSMOS-directed program was held at Waite High School in Toledo Public Schools to provide additional mathematics instruction to students in the second year of a two-year algebra course, primarily 10th grade students, who needed to take the Ohio Graduation Test. COSMOS hired three mathematics/science majors or master's students from BGSU who participated in 12 hours of professional development before instructing the Waite students. The Waite students volunteered to attend this lunch time program in which they learned math for the 25 minute period (32 students signed up and 24 students attended at least three times). Of those who participated in the program and had an OGT score, 91.3% passed the OGT compared to 75% of the other Algebra B students. Since Data Analysis and Probability were the only benchmarks addressed during instruction, the passage rates for this standard were analyzed: 95.7% of the participants passed this standard on the OGT compared to 83.3% of the comparison group. The 18 students who returned surveys overwhelmingly perceived this program as a positive experience and recommended that it be continued. Of the three instructors, one was already earning a degree in mathematics education; the other two instructors are now part of the TeachOhio cohort to become science teachers through alternative licensure (see Pre-Service Teacher Preparation and Recruiting Activities).

## *LessonLab*

This partnership with LessonLab (headquartered in California) began as a pilot two years ago in northwest Ohio with 75 teachers. The mathematics professional development is based on results of the TIMSS video analysis. Selecting from the big ideas in mathematics, each module (2 graduate credit hours) explores the content as well as the pedagogical content knowledge needed for the classroom. Teachers examine a video of a classroom engaged in the content in question. A mini-lesson study develops with the teachers. Based on rich problems and probing questions, the teachers write lesson plans for their classrooms and critique one another. Due to the success of the pilot year, ODE pledged an additional two years of support and expanded the offerings throughout the state of Ohio (with a goal of reaching 1,500 teachers). The expanded group (involving five universities) may seek outside funding for the continuation and possible expansion of the project and may look to the Centers for assistance.





**Northwest Ohio Center of Excellence  
in Science and Mathematics Education**

coordinating partners



# NWO EVALUATION



One of the high priority needs identified in the FY 2005 annual report was to obtain quality evaluation data and systemize our evaluation procedures. In 2006, NWO partnered with the University of Cincinnati Evaluation Services Center (UCESC), and two retreats were held to develop a logic model and evaluation plan. A full-day retreat took place on January 27, 2006 (led by UCESC) with a follow-up half-day meeting on February 3, 2006. The resulting logic model (Appendix L) provided us with a set of clearly defined and measurable outputs that fit the evaluation plan presented in the NWO Memorandum of Understanding for new Center funding, yet aided us in refining our goals and expected outcomes.

The Center-identified goals, as defined by the logic model, are (a) improve capacity to enhance student achievement; (b) increase recruitment of pre-service and retention of teachers of science and mathematics; (c) improve in-service teacher preparation and faculty development in science and mathematics education; (d) strengthen coordination and communication to increase sustainability, and (e) increase collaboration among partners.

Taking goals one and two as examples, the Inquiry Series aims to change teacher practices to increasingly reflect best practices and contribute to the larger goal of improving preparation of teachers and faculty. Outcomes of the Inquiry Series aim to change teacher beliefs about their practice and improve their pedagogical skills such as quality questioning, student-centered teaching, and continual assessment. These outcomes can be measured by recording the level of involvement of participating teachers, the number of sessions attended by participants, post and retroactive-pre surveys on teaching beliefs, and classroom observations. More specifically, we used the following:

- Teacher Beliefs Instrument (TBI), which examines teacher perceptions regarding teaching science and mathematics. This instrument consists of three main parts: survey of beliefs about teaching science and mathematics, classroom learning environment survey, and instructional practices inventory.



- Session evaluations which asked participants to provide feedback on professional development activities with which they participated.
- Classroom observations and interviews with highly involved participants.
- An online survey to determine participants' perceptions and experiences with the NWO Center.
- Telephone interviews with eight higher education faculty highly involved with the NWO Center.

These evaluation activities were conducted by both the NWO Center and UCESC. All evaluations and activity data were submitted to UCESC for analysis. Their executive summary is included in Appendix L and the full UCESC Evaluation Report has also been provided to OBOR.

From the resulting evaluation report, it is evident that the improvement of teacher and faculty preparation was a significant accomplishment of the Center. In general, professional development provided by the Center aided participants in gaining knowledge and skills in best practices and impacted participants' willingness to impart their newly acquired skills in the classroom. The Inquiry Series, as well as larger scale professional development activities, contributed extensively to the goal of improving the preparation of teachers and faculty. Both the Inquiry Series Blast-Off and Summit and the NWO Symposium were rated as excellent overall. A large number of attendees and a broad range of presentation topics characterize these events. Many of these professional development offerings were designed for multiple audiences; in-service and pre-service teachers were all strongly encouraged to attend.

The Inquiry Series consisted of six professional development days, one each month on a different aspect of inquiry: introduction to inquiry, questioning, standardized tests and inquiry, planning for inquiry, assessing inquiry via writing, and assessing inquiry via performances and projects. Each of these sessions was followed with a participant survey to gauge the value of the session, any shortcomings, and recommendations for improvement.

Three raters independently coded the evaluation summaries into five emergent themes and sub-themes. Feeling supported in some way was a predominant theme. Participants found value in talking and exchanging ideas with their peers, mentioning sharing, collaborating, and discussing with other teachers.

*"I actually gained positive ideas from listening to other, older educators."*

Participant in "Planning for Inquiry," January 19, 2006

*"I plan to collaborate more with other colleagues for ideas."*

Participant in "Inquiry via Writing," February 23, 2006



The evaluations also highlighted the support the teachers felt from NWO either in the form of ideas conveyed during the Inquiry Series for pedagogical tools they could use in their classrooms or because of changed attitudes, confidence, or reflection elicited through participation with NWO professional development activities. Similarly, teachers valued the lesson ideas and activities they learned about either from other teachers, presenters, or NWO leadership.



*“Everything I have learned here I have used in my classroom.”*

*“I think [this] will motivate me to use performance assessment when possible.”*

Participants in “Assessing for Inquiry,” March 16, 2006

Many teachers mentioned inquiry and standardized testing. Inquiry was a theme throughout the NWO professional development program, and standardized testing was addressed directly at one of the monthly sessions, “Inquiry Meets the Test.” Particularly enlightening were comments that did not simply mention inquiry but expressed a change in motivation or beliefs regarding inquiry. Participants reported that they benefited from the professional development by not only learning more about the pedagogy topic of the month, but by actually learning to connect the topic to inquiry. For example, a session on assessment helped teachers learn to evaluate student knowledge in a student centered lesson.

In conclusion, a main theme that emerged from qualitative survey evaluations of the Inquiry Series was that participants valued the collaborative aspect of the Inquiry Series overall and found it very useful to have a chance to discuss classroom strategies with peers from other schools. In light of this, the NWO Inquiry Series has been restructured to bring together a far greater number of teachers and pre-service teachers than previously served and has been re-designed to encourage social mixing and discussion before participants go to their particular sessions.



The positive effects of professional development activities on teacher beliefs as measured by the Teacher Beliefs Instrument suggest increased teacher capacity – a first step towards another Center goal of increasing student achievement. Other activities such as the Math Lunch Time Instruction Program resulted in notable improvements in student performance on the OGT and related standards for students at a high-risk Toledo School: 91.2% of participating students passed the OGT as compared to 75% of non-participating students.

The Research Learning Community and Dialogues Across College Barriers have assured that coordination among and between faculties and with funding agencies were addressed at each of the NWO's two key institutions. Recruitment and retention of teachers was addressed directly through programs such as the MAT scholarships and TeachOhio as well as indirectly through large-scale events and symposia. While these “broad brush” activities are useful to boost interest in teaching, specific recruitment activities throughout northwest Ohio were recommended by UCESC.

Finally, the Center has made substantial progress in its goal to increase collaboration among partners. Projects such as NWO TEAMS and TeachOhio are clear examples of direct collaboration between the Center and high-risk school districts, as well as collaboration between key institutions. These collaborations will continue to develop, and the newer partners, University of Findlay, Owens Community College, and Lourdes College, will strengthen their role with the Center in terms of supporting the region's teacher education programs.

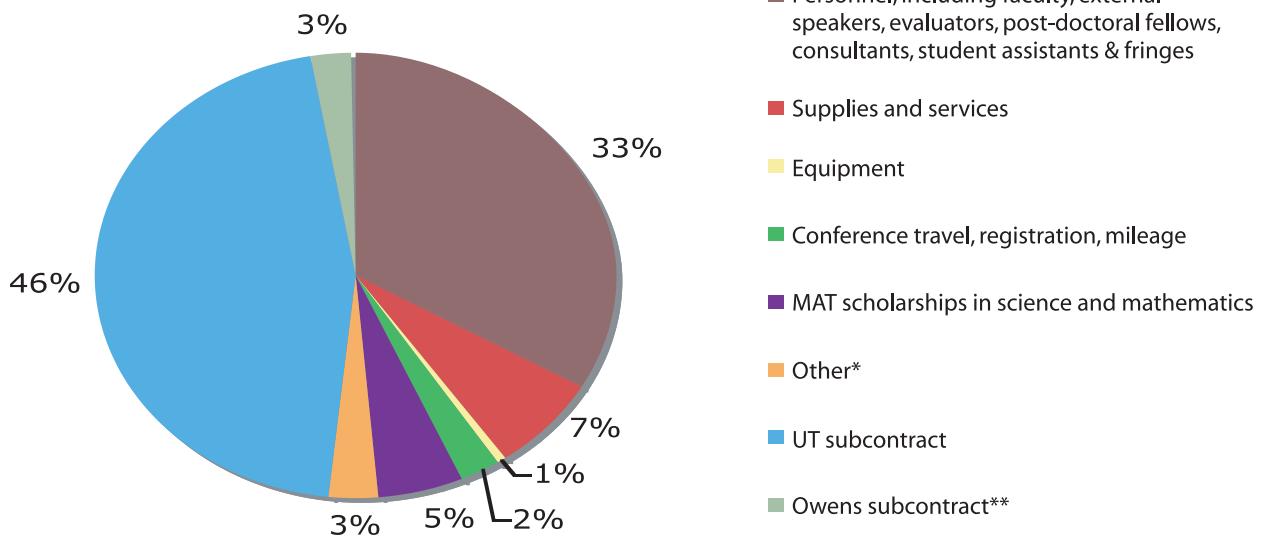
The complete evaluation report is included in Appendix K and includes recommendations for future efforts of NWO with regard to meeting goals as well as recommendations for furthering efforts to collect and measure the outcomes of these goals.



# FY 2006 NWO BUDGET

## FY Expenditures for July 1, 2005 - June 30, 2006

Personnel, including faculty, external speakers, evaluators, post-doctoral fellows, consultants, student assistants & fringes	\$119,301
Supplies and services	\$24,904
Equipment	\$2,456
Conference travel, registration, mileage	\$8,573
MAT scholarships in science and mathematics	\$19,237
Other	\$11,031
UT Subcontract	\$121,389
Owens Subcontract	\$10,000
Indirect Costs	\$13,574
Total Direct Costs	\$358,845
<b>TOTAL</b>	<b>\$372,419</b>





The table below shows the above categories for 2004-05 and 2005-06 and the amount spent in each of the categories.

Expenditures	Funding Year	
	2004-2005	2005-2006
Personnel	\$68,804	\$119,301
Supplies & services	\$7,994	\$24,904
Equipment	\$2,767	\$2,456
Conference travel, registration, mileage	\$2,844	\$8,573
MAT tuition waivers	\$40,639	\$19,237
Other	\$20,710	\$11,031
UT subcontracts	\$108,468	\$121,389
Owens subcontracts	\$2,019	\$10,000
Indirect costs	\$9,288	\$13,574
Total direct costs	\$254,245	\$358,845
<b>TOTAL</b>	<b>\$263,533</b>	<b>\$372,419</b>



# OTHER ACCOMPLISHMENTS



Pictured from top left: Julie McIntosh, Bill Weber (representing Carla Johnson), Emilio Duran, Jodi Haney, Steve Van Hook. From bottom left: Michelle Leow Klinger, Linda Lower, Anjali Gray, Anne Bullerjahn, Robin Brown. Not Pictured: Mitch Magdich, Jane McCleary, Mary Richter.

## Building of Relationships:

### • NWO Executive Board:

The first meeting was September 29, 2006, and the minutes are attached as Appendix J.

Anne Bullerjahn	Professor, Math/Science Dept.	Owens Community College
Emilio Duran	NWO Co-Director	University of Toledo
Anjali D. Gray	Asso. Professor & Chair of Bio & Health Science	Lourdes College
Jodi J. Haney	Director, COSMOS/ NWO Co-Director	BGSU
Carla Johnson	Asst. Professor/ Curr & Instruction	University of Toledo
Michelle Leow Klinger	Director, Project ISIS Teacher Programs and Resources	COSI Toledo
Linda Lower	Customer Service Manager	Perstorp Polyols, Inc.
Mitch Magdich	Curator of Education	Toledo Zoo
Jane McCleary	Curriculum Director	Hancock County ESC
Julie McIntosh	Assistant Professor, AYA and Multi-Age Program Director	The University of Findlay
Mary Richter	Regional School Improvement Facilitator	Northwest RSIT
Stephen Van Hook	Assistant Professor, Physics & Astronomy PRISM Director	BGSU

- *NWO Partnership:*

The NWO partnership is expanding and our active membership now includes the following groups:

- Faculty from Colleges of Education and Arts and Sciences (BGSU, Findlay, Lourdes, Owens, UT)
- Pre-service teachers
- In-service teachers, including master's degree-seeking students (20+ counties, 40+ school districts)
- Public school administrators
- Educational service centers
- Business partners - Ball corporation, Perstorp Polyols, Inc.
- Community agencies - Toledo Zoo, COSI Toledo, metro and county parks, botanical societies, technology agencies, soil and water districts, etc.

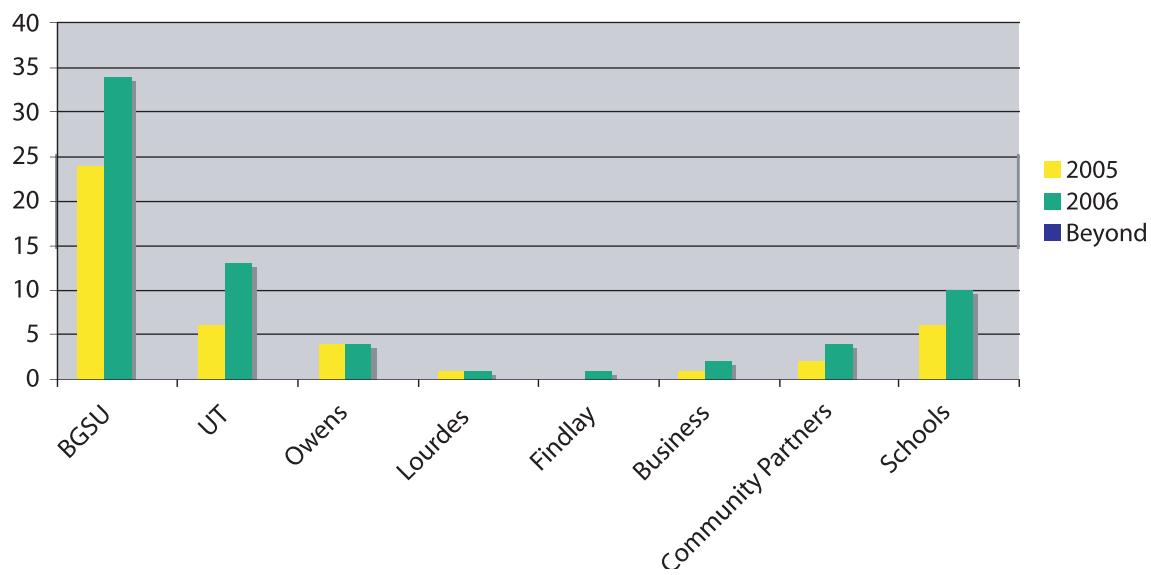
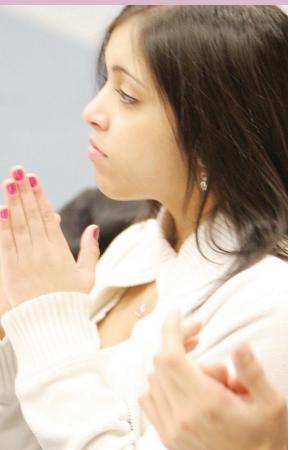


Chart: The NWO partners by institution/organization and year of participation.



# ISSUES, PROBLEMS, AND ANTICIPATED SOLUTIONS

- 
- The biggest issue to date is still strengthening the collaborative efforts between UT and BGSU. However, with the new memorandum of agreement and with the new directors, it appears that the NWO Center is steadily moving in the right direction. As per the memorandum of agreement, additional activities are being jointly sponsored each year by the three groups (BGSU, Owens, and UT). A new NWO website has been created to encompass all of the activities of COSMOS and SciMaTEC (<http://www.nwocenter.org>). Many activities are now NWO activities (previously associated with only one institution) and we've expanded our base of support at the higher education institutional level to include The University of Findlay and Lourdes College. We've recruited high-needs districts for participation in our collaborative affiliated projects. We've jointly created a new mission and vision statement along with corresponding goals to guide our Center activities. We will continue to seek out potential collaborations within the region and especially between UT and BGSU.
  - However, there exists a great deal of tension between a few vocal members of the College of Education at the University of Toledo and The College of Arts and Sciences at the University of Toledo and COSMOS at BGSU. SciMaTEC is now directed by the NWO Co-Director Emilio Duran of the Biological Sciences Department. Many of the successful NWO collaborative efforts have been between COSMOS and Emilio Duran, along with several other Arts and Sciences and Education faculty and administrators at UT. Unfortunately, there have been frequent struggles within UT over a diversity of issues and these struggles have had direct and negative impacts on NWO. We believe the best solution is to continue to pursue those relationships that are working and to raise awareness and institutional support for our regional collaborative efforts. The rest of the collaboration seems to be working very well. We have made many friends and eager partners around the region.



- By encouraging STEM and STEM education faculty to collaborate on Center grants and activities, we decrease the apparent diversity and sheer number of proposals, when in effect the submissions are stronger, more complimentary, and more diverse. To address this issue, we will work with OBR, ODE, and other funding agencies to raise awareness regarding the nature of such Center collaborations. We also want to be sure that working as a Center of Excellence does not limit the number of funded proposals that would be attained in the region without the Center's existence. So our focus will be to submit multiple, but well-coordinated and highly collaborative, NWO proposals.
- Although a sign of our success, the rapid growth of the NWO Center has resulted in a need to develop an investment strategy to build Center capacity to create, support, implement, and evaluate newly funded and future Center initiatives. We will work with the NWO Executive Board and within each higher education institution to craft this investment plan.
- There is a great deal of inequity of infrastructure among institutions. As described below, BGSU has a solid infrastructure in place, yet UT/SciMaTEC resources have been greatly reduced. There is a small operating budget is in place but there is no secretarial or GA support and the limited space available currently under renovation. Moreover, Owens Community College, Lourdes College, and the University of Findlay do not have an infrastructure for this sort of work. We will continue to discuss ideas to build the infrastructure needed to support the region.

# PROJECTED GOALS AND ACTIVITIES

## Our collective goals for FY 2007 include:

- *To continue to establish a strong Center identity while clarifying the Center's role and successfully delineating the relationship between the partnering institutions (NWO, COSMOS, and SciMaTEC). We will develop Center policies and bylaws to explicate the Center's role and to describe the relationship between and responsibilities of NWO, COSMOS and SciMaTEC. We will further define what it means to be an NWO/COSMOS/SciMaTEC project.*
- *To serve as a collaborative funding and professional development network for northwest Ohio. By further involving OCC, LC, and UF, strengthening BGSU-UT collaboration efforts, building on the solid collaborative foundation that the Center has with surrounding school districts, and working with OBR to raise awareness regarding the nature of Center collaborations, we will be able to regionalize and operationalize our efforts to ensure improved partnerships while increasing funding and programmatic opportunities.*
- *To develop an investment strategy to build up Center infrastructure and capacity needed to develop, support, implement, and evaluate both existing and future Center initiatives.*
- *To build a network for dissemination and communication of regional STEM education news, events, and professional and faculty development opportunities by encouraging all partners and participants to spread the word to their colleagues, through our NWO print publications (brochures, announcements, etc.,) and through better use and coordination of the NWO/COSMOS/SciMaTEC websites.*

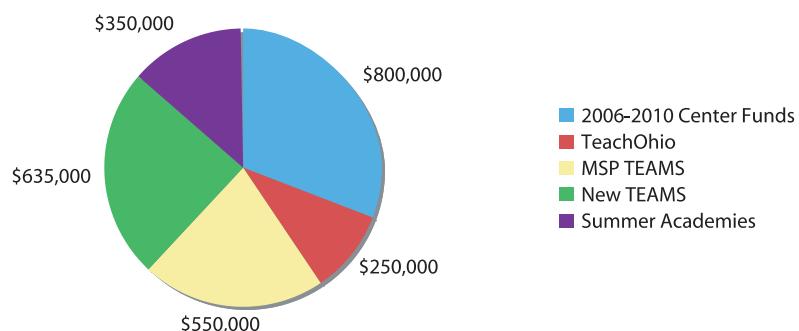


# RESOURCE DEVELOPMENT AND SUSTAINABILITY

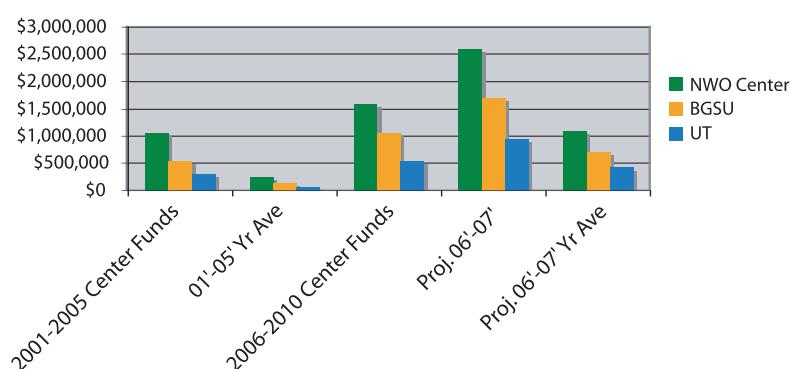
- At BGSU, the administration has extended strong financial support to COSMOS this year. University monies are paying the newly hired director. In addition, the University is paying for a half-time secretary and approximately 75% of the assistant director salary and benefits. BGSU will also fund a three-hour course release for two associate faculty each semester to conduct research and contribute to grant-writing efforts. Moreover, COSMOS now has an internal budget of \$10,000/year to serve as a university hybrid (research and teaching) center. COSMOS is now officially “housed” in the Graduate College to promote quality research and grant writing activities. This support will ensure the life of the Center beyond Ohio Board of Regents funding.

## Center Funding Sources

Although Center funding from OBR will decrease over the next four years, funds from other grants will not only sustain current activities, but will also support the rapid growth of proposed Center activities.

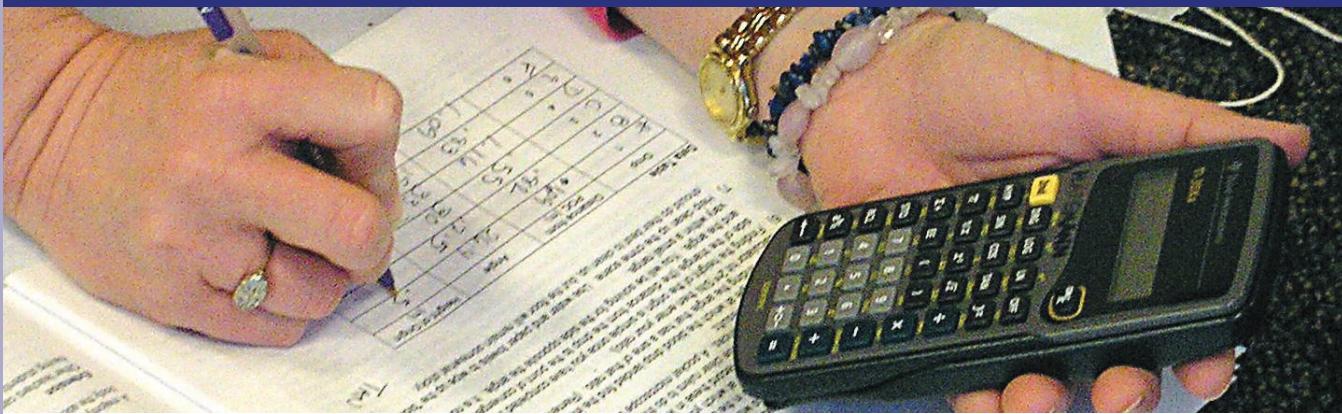


**Pie chart: Center funds contributed by OBR will constitute a small percentage of the total operating budget of FY 07. Projected grant dollars from several key initiatives will significantly contribute toward our sustainability.**



**Graph: As center funding from OBR decreases over the next four years, the projected yearly operating budget will increase dramatically with the funding of grants from OBR and Ohio Department of Education from approximately \$250,000/year during 2001–05 to just over \$1,000,000/year in 2006–07.**

# ON-THE-HORIZON PROJECTS



NWO participants are currently seeking funding for several key initiatives aligned with the Center mission, vision, and goals.

- One such project is the Regent's Academy. The result of House Bill 115, it is one of five pieces of the Ohio CORE SUPPORT legislation, aimed at recruiting students into STEM disciplines. The NWO proposed academy (REAL: Regents Environmental Academy to enhance Learning) would include a summer and academic year component, with participants receiving dual credit while experiencing problem-based, application-oriented instruction in the STEM disciplines. If funded, NWO will receive \$350,000 for phase one, with renewal funds anticipated.
- NWO Center collaborators are submitting five 2006 OBR Improving Teacher Quality grants. These grants were coordinated in several ways. First, by hosting our first annual COSMOS "Grants Fair" aimed at initiating university-school district partnerships. A number of high-needs and local district administrators were invited to come meet with principal investigators to establish collaborative partnerships. COSMOS also employed a mentor program, pairing veteran grant writers with new writers. We also coordinated projects to be sure that they all focused on different populations of teachers and students (so that we would not be competing with one another). Thus, the NWO grants encompass mathematics and science across all grade levels.

Elementary mathematics - **UT**

Elementary physics - **BGSU**

Middle school environmental science - **BGSU**

High school probability and statistics - **BGSU**

High school science and technology - **BGSU**



# ORC COLLABORATION



The Center has been actively involved in promoting the Ohio Resource Center through courses, Center programs aimed at fostering research-based best practices, and other professional development offered by the Center faculty.

- The LessonLab materials in mathematics that are being shared with school districts are notably aligned with state and NCTM best practices. Moreover, they promote the use of lesson study. During this professional development, faculty referred the participants to the ORC website.
- In most of the science and mathematics methods classes, students have assignments that involve the use of lesson plans from the ORC. Similarly, in some of the mathematics classes for early childhood majors and for middle childhood majors, students must search for a lesson plan on a given topic and explain how they would adapt the lesson to the grade level they would like to teach.
- Many of the MAT scholarship students and NWO teachers are using the ORC lesson plans in their classrooms and are presenting the results of the lesson implementation to the NWO partners at the Blast-Off (beginning of the year), Symposium (mid-year), or Summit (end of the year) events.
- During the OSCI module revision process, the NWO TEAMS Curriculum Revision Team was directed to ORC lessons when searching for research-based best practices lessons. NWO TEAMS participants are frequently reminded by their facilitators of the quality resources available at the website.
- The NWO website has a search feature which allows teachers visiting the site to search ORC for high-quality lessons, assessments, and other resources.
- We have started the discussion with the ORC as to how we may serve as a regional lesson submission site. We could encourage teachers to submit lessons to our website, we could give an initial review using the ORC rubrics, and then the ORC could access these “ready to review” lessons from our website.



# NWO CENTER: LEADERS IN STEM LEARNING



Together, the NWO partners have created a newly revised mission, vision, and set of goals. We have a new collaborative structure in place including one united executive board. We've created a new NWO logo, as well as letterhead, and a website to document and convey our move forward as a Center. We believe as a collective we provide second-to-one professional development to our region's teachers and higher education faculty. We have built a unified evaluation plan to better measure the impact of our work and now are disseminating this impact through presentations and publications. In sum, we are a Center leading the way. Our regional partnership is becoming true and solid. We are proud of our past accomplishments and dedicate ourselves to achieving our newly established goals that were generated based on our participant needs assessments and feedback, the UCESC evaluation report, and NWO faculty/staff reflection. To repeat an important theme, what exists today in northwest Ohio is a very different STEM education community than what existed in 2001. We look forward to our work as a regional collaborative to take on the challenges of the upcoming year.





**Northwest Ohio Center of Excellence  
in Science and Mathematics Education**

coordinating partners



# APPENDIX A

# NWO Center Brochure

The image is a composite of several panels from the NWO website. At the top, there's a banner with a boy holding molecular models and a girl in a lab coat. Below it is a quote: "This helps me focus on being a better teacher". The main content area features a large orange background with text about the center's mission and various educational partners. On the right, there's a logo for 'COSMOS' and 'SciMaTEC'. At the bottom, there's a photo of students in a lab and a call-to-action: "Advancing science, technology, engineering, and mathematics education for people of all ages". Logos for BGSU, OWENS, and THE UNIVERSITY OF TOLEDO are at the very bottom.



**COSMOS: Center Of Excellence in Science and Mathematics Education:  
Opportunities for Success**

*A Partner of the Northwest Ohio Center of Excellence at Bowling Green State University*

**COSMOS Initiatives**  
<http://cosmos.bgsu.edu>

**Inquiry in Science and Mathematics Education Series**  
**Master of Arts in Teaching (MAT) Program Scholarships**  
**Research Community for University Faculty**

**NWO Activities**

**Teacher Professional Development**

**Inquiry in Science and Mathematics Education Series**  
This series of monthly workshops follows the thread of inquiry (e.g., questioning, lesson planning, assessment, standard testing) and provides teachers with the chance to discuss barriers that impede implementing inquiry-based instruction in their classroom in small-group settings (study groups) as part of each session.  
**Graduate credit and full tuition scholarships available.**

**NWO Annual Symposium**  
Northwest Ohio Symposium on Science, Mathematics, and Technology Teaching (NWO Symposium) has brought together 300–500 participants to exchange effective strategies for teaching science and mathematics. This event gives all participants resources and ideas they can put to immediate use in their classroom.

**Master of Arts in Teaching (MAT) Program Scholarships**  
The coursework for these graduate programs has been developed in part by NWO faculty to blend content consistent with the Ohio and National Standards with research-based pedagogical techniques. Currently programs exist in mathematics and physics education and an integrated science program is in development.

**Pre-Service Teacher Preparation and Recruitment**

**BG/UT Science Education Council of Ohio (SECO) and BG/UT Ohio Council of Teachers of Mathematics (OCTM) Activities**  
These professional organizations provide undergraduate students with high-quality teacher development opportunities.

**PRAXIS II Tutoring Sessions**  
PRAXIS II preparation workshops and tutoring are hosted by science, technology, engineering, and mathematics (STEM) faculty who themselves have taken the PRAXIS content tests to better prepare their undergraduate students.

**Future Teacher Conference**  
This event provides prospective teachers with the opportunity to discuss issues related to education as a career choice with in-service teachers and faculty. This conference is unique in that the pre-service teachers themselves organize the event.

**Ohio Junior Science and Humanities Symposium**  
This symposium brings the best and brightest talents from Ohio high schools together for a competition to highlight and judge the quality of their projects in the sciences and humanities. This event is an excellent opportunity for the recruitment of the next generation.

**Faculty Development and Collaborative Research**

**Research Community for University Faculty**  
Faculty read and discuss leading research on how people learn science and mathematics, present research talks to design and develop new projects, and discuss work in progress or share the findings from a completed study. Importantly, presenters receive feedback from their peers and discuss new potential collaborative research project ideas.

**Dialogues Across College Barriers Forum**  
This luncheon series promotes cross-college and cross-institution conversations about teaching and learning.

**Collaborative Content Course Development**  
Science, mathematics, technology, and engineering courses for education majors infusing research-based best practices.

**Associated Projects**

**NWO TeachOhio**  
An externally funded program to recruit and prepare 20 grades 7-12 science and mathematics teachers via alternative routes to licensure leading to a master's degree. **Scholarships and internships available.**

**MSP - NWO TEAMS**  
The purpose of this grant project is to increase science and mathematics academic achievement of students in grades 3-6 by enhancing the content knowledge and teaching skills of classroom teachers using revised and enhanced OMAP and OSCl modules.  
**Graduate credit and teacher stipends available.**

**NSF - GK-12 PRISM**  
NWO is a collaborating partner with the GK-12 NSF grant Partnership for Reform through Inquiry in Science and Mathematics, which develops co-teaching partnerships between K-12 classroom teachers and science and mathematics graduate students. For more information, see the PRISM website: <http://prism.bgsu.edu/>

**Be a COSMOS STAR!**  
To join COSMOS, go to our website: <http://cosmos.bgsu.edu>

**COSMOS & NWO Director:**  
Jodi J. Haney, Ph.D. • [jhaney@bgsu.edu](mailto:jhaney@bgsu.edu)

**For more information, contact:**  
Michelle Shafer, COSMOS Assistant Director  
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Nancy Hoose, COSMOS Secretary  
[nhoose@bgsu.edu](mailto:nhoose@bgsu.edu)

241 Math Science Building  
Bowling Green State University  
Bowling Green, OH 43403-0212  
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To learn more about SciMaTEC,  
go to our website: <http://www.scimatec.org>

SciMaTEC Director & NWO Co-Director:  
Emilio Duran, Ph.D. • [emilio.duran@utoledo.edu](mailto:emilio.duran@utoledo.edu)  
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The University of Toledo, Toledo, OH 43606  
Office: 419.530.8456 • Fax: 419.530.8459

**SciMaTEC Initiatives**  
<http://www.nwocenter.org>

**NWO Annual Symposium**  
**Faculty Research Associates**  
**Ohio Junior Science and Humanities Symposium**  
**Future Teacher Conference**





**SciMaTEC: Science, Mathematics, and Technology Education Center**

*A Partner of the Northwest Ohio Center of Excellence at the University of Toledo*

# APPENDIX B

## 2006 Northwest Ohio Symposium on Science, Mathematics, and Technology Teaching Program





***You have a wonderful opportunity this year to win some great classroom resources.***

***You have enclosed in your registration envelope a yellow card to take around to the vendors in the Atrium. Each vendor has a different stamp. Get your card stamped by twelve different vendors and you will be entered in a special drawing for prizes that will be awarded between 5:00 and 5:30 on Saturday evening.***

***Drop your completed card (front and back) in the box at the check-in desk. Be sure to come back to the check-in area after your last session to see if you have won one of the great raffle prizes.***





# Welcome

1

We welcome you to the 2006 Northwest Ohio Symposium on Science, Math and Technology Teaching. This year, the symposium is again sponsored by the Northwest Ohio Center of Excellence in Science and Mathematics Education and its partners throughout the region. This event offers the invaluable opportunity for P-16 teachers to share and learn from one another in our common effort to advance science and mathematics education for people of all ages.

Last year, more than 500 university professors, teachers, graduate and undergraduate students, participated in over 80 sessions. We are expecting similar numbers this year. Additionally, the 2005 Symposium included 21 vendors from various educational resources. This year, 23 vendors will participate to keep educators abreast of new and exciting classroom materials. Once again, attendees will be allowed to examine new textbooks, pick up equipment for classroom use and preview some of the new classroom technologies now available. Lastly, 21 sponsors are donating more than \$100 worth of classroom materials and supplies to all attendees.

We are hoping that the 2006 NWO Symposium on Science, Math and Technology Teaching will be an even bigger success than last year. With your help, we will continue to make this symposium the premier educational opportunity for science, mathematics and technology teachers in Northwest Ohio. Thank you for joining us!

Dr. Emilio Duran  
SciMaTEC, UT  
NWO Co-Director

Dr. Jodi Haney  
COSMOS, BGSU  
NWO Director

Dr. Anne Bullerjahn  
Owens Community College  
NWO Executive Board Member





## Dr. David Carlson



The International Polar Year, 2007 through 2008, will represent one of the largest coordinated studies of our home planet ever attempted. Scientists from more than 60 countries, along with engineers, software designers, technicians, students, mechanics, cooks, pilots, and many other specialized polar support staff, perhaps 50,000 people in total, will work together to achieve the goal of understanding physical, ecological and social changes in polar regions and the impact of those changes on the rest of the planet. This talk will review some recent changes in polar regions that stimulate the interest and concern of people around the world. Dr. Carlson will show a few examples of the broad range of IPY science projects, and introduce the vast array of education and outreach events, including films, television series, museum exhibitions, and regular broadcast coverage. He will describe how educational institutions and individual educators can join or conduct local IPY events, can develop and evaluate new polar science educational materials, and can share and assess new engagement strategies that could have an enormous impact on public perception of science and on science education.

David Carlson received a B.A. in Biology from Augustana College, Rock Island, IL (1973) and a Ph.D. in Oceanography from the University of Maine, Orono, ME (1981). He served as an NRC Post-Doctorate Research Associate at the Naval Research Laboratory in Washington, DC.

He served on the graduate faculty in the College of Oceanography at Oregon State University from 1983 through 1990. While at OSU, he led research and education programs in the areas of marine chemistry, small-scale ocean physics and rheology, oceanic microbiology, and intertidal chemical ecology. Dr. Carlson designed and produced an ocean surface sampling system still in use in several oceanographic laboratories. He also developed new techniques for exploring molecular-scale rheology and for assaying photorepair enzymes.

He joined the University Corporation for Atmospheric Research in 1991 to lead the Tropical Ocean Global Atmosphere - Coupled Ocean Atmosphere Response Experiment (TOGA COARE) International Project Office. Dr. Carlson and the TCIPO staff worked with leading international scientists to plan and implement this large research experiment involving 1200 people from more than 20 nations. The project focused on the western Pacific tropical warm ocean pool because of that region's influence on global atmospheric circulation and on global climate variability. From 1994 to 2003, Dr. Carlson directed the Atmospheric Technology Division within the National Center for Atmospheric Research. The Atmospheric Technology Division provided advanced observing systems and associated support services to university researchers for purposes of climate and weather research worldwide. Under Dr. Carlson's leadership ATD built significant new capabilities in active and passive remote sensing, trace gas and particle detection, signal processing, computerized machining, and data visualization and distribution; Dr. Carlson led the planning, proposal, and acquisition process for an \$80M aircraft, one of the largest single-item developments in NSF Geoscience history. Dr. Carlson also stimulated an innovative summer undergraduate engineering internship program.

During 2004, Dr. Carlson took a sabbatical year with the Climate and Global Dynamics Division at NCAR, working on upper ocean – lower atmosphere exchange processes.

Starting in 2005, Dr. Carlson serves as Executive Director of the International Programme Office for the **International Polar Year**. The IPY, planned for 2007 through 2008, represents an international effort to draw research and public attention to polar regions, particularly to the role of polar regions in global climate change and to the impacts of climate change on polar regions. The IPY International Programme Office resides at the British Antarctic Survey in Cambridge, England.



## International Polar Year Youth Steering Committee

### Want to Get Involved in the International Polar Year?

#### Now is Your Chance!

The International Polar Year (IPY; [www.ipy.org](http://www.ipy.org)) is an international effort, involving more than 50 countries, to focus research efforts in both the sciences and social sciences on the world's Polar Regions. In order to secure youth involvement in all aspects of the IPY, the Youth Steering Committee (YSC) was formed, aiming specifically to network young polar researchers from all backgrounds to enable collaboration and to involve this group in outreach focused towards other young people. This is a chance to network and work with youth from 14 countries around the world who are committed to positive action for the poles. More information can be found on the YSC website at [www.ipyyouth.org](http://www.ipyyouth.org).

The Youth Steering Committee has formed a series of working groups to further develop our large set of programs. This is your chance to get involved and help guide the direction of the activities targeting youth and young researchers. Here's what you can help us with:

#### IPY Early Career Working Group

Early career scientists and researchers (undergraduates through assistant professors) can network and share opportunities for getting involved with polar research. Help the next generation of polar researchers make the most out of the International Polar Year. They are the future of polar research. For further information or to get involved with this working group please contact Jenny Baeseman at [jbaesema@kent.edu](mailto:jbaesema@kent.edu).

#### Polar Contests Working Group

These contests will network young polar researchers around the world and involve them in educational outreach to other young people. Give youth the opportunity to learn about the Polar Regions and express what they have learned creatively. Help us set up Polar Contests internationally and assist youth from your country to present their work at the International Youth Conference on the Poles. For further information or to get involved with this working group please contact Melanie Raymond at [melianieraymond@yahoo.co.uk](mailto:melianieraymond@yahoo.co.uk).

#### Website Working Group

Make the Youth Steering Committee website as exciting and interactive as possible. Your work will help youth and young researchers from around the world to connect. For further information or to get involved with this working group please contact Melanie Raymond at [melianieraymond@yahoo.co.uk](mailto:melianieraymond@yahoo.co.uk).

#### International Youth Conference on the Poles Working Group

Taking place in 2008, the International Youth Conference on the Poles will bring youth from around the world together to present their research, talk about issues affecting the polar regions and learn more. Help to make this a reality.

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## International Polar Year Youth Steering Committee

#### Students on Ice Working Group

During Polar Year, Students on Ice will take hundreds of youth from around the world to the Polar Regions. Help them make this a reality for as many youth as possible.

#### International Geophysical Year Working Group

The International Geophysical Year took place 50 years ago. Now we have the chance to bring together youth and the researchers who worked in the Polar Regions at this time.

#### Legacy Working Group

Youth around the world know what they want to see International Polar Year accomplish. Provide them with the opportunity to share this voice.

If any of these groups appeals to you, you want to get involved, or you want more information, please send an email to: [info@ipyyouth.org](mailto:info@ipyyouth.org) or visit: [www.ipyyouth.org](http://www.ipyyouth.org)

If you work for an organization that would like to get involved with some of these projects please let us know. We'd love to have you involved in the working groups.

**This is your chance to make a difference and get involved in International Polar Year.**

**Carpe Diem!**





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# Conference Agenda

## Friday

- 9:30 am – 10:15 am ..... Check-in
- 10:30 am – 11:30 am ..... Keynote Address
- 11:45 am – 12:30 pm ..... Lunch in the Atrium
- 1:00 pm – 1:45 pm ..... Vendor Check-in
- 1:00 pm – 2:00 pm ..... Session A
- 2:15 pm – 3:15 pm ..... Session B
- 3:30 pm – 4:30 pm ..... Session C

**Vendors open from 2:00 pm - 4:00 pm in Atrium**

## Saturday

- 7:00 am – 8:00 am ..... Check-in and Breakfast in Ballroom
- 8:15 am – 9:15 am ..... Session D
- 9:30 am – 10:30 am ..... Session E
- 10:45 am – 11:45 am ..... Session F
- 11:45 am – 12:30 pm ..... Lunch pick up in Brasseire, Eat in  
you next session's room
- 12:45 pm – 2:45 pm ..... Session G
- 3:00 pm – 5:00 pm ..... Session H
- 5:00 pm – 5:30 pm ..... Raffle Prize pick-up in Check-in area

**Vendors open from 8:00 am - 4:00 pm in Atrium**





## Conference at a glance - Fri.

### Session A (1:00 pm - 2:00 pm)

A-1	<b>STC/MSTM: Human Body Systems</b> <i>Presented By:</i> Sally DeRoo, Carolina Biological Supply Company	Limit 40 <b>Room: Ballroom 1</b>
A-2	<b>Zoos: Menageries and Math</b> <i>Presented By:</i> Linda Calcamuggio, Toledo Zoo	Limit 50 <b>Room: Ballroom 2</b>
A-3	<b>Tales From the Whale</b> <i>Presented By:</i> Marcia Kaplan, Whale of a Tale	<b>Room: Ballroom 3</b>
A-4	<b>Natural Inquirer: Inquiring into Environmental Science</b> <i>Presented By:</i> Don Howlett, USDA Forest Service	<b>Room: Ballroom 4</b>
A-5	<b>Professors Analyzing Their Teaching</b> <i>Presented By:</i> George Shirk, The University of Toledo Janet Struble, The University of Toledo Alison Spongberg, The University of Toledo Vernon Brown, The University of Toledo	<b>Room: Owens</b>
A-6	<b>Science, Mathematics and the Toledo Museum of Art</b> <i>Presented By:</i> Carolyn Rozko, Toledo Museum of Art	<b>Room: Parlor A</b>
A-7	<b>OhioView SATELLITES-Students, Teachers, Scientists using Geospatial Technologies</b> <i>Presented By:</i> Terri Benko, The University of Toledo Kevin Czajkowski, The University of Toledo Mandy Munro-Stasiuk, Kent State University	<b>Room: Parlor B</b>
A-8	<b>Track Tales - Becoming a Nature Detective</b> <i>Presented By:</i> Eileen Sawyer, Bowling Green State University	Limit 25 <b>Room: Steuben</b>
A-9	<b>Let's Get Them Talking! Discourse in the Math Classroom</b> <i>Presented By:</i> Julie Nurnberger-Haag, Bowling Green State University	Limit 30 <b>Room: Waterford</b>
A-10	<b>Physical 3-D Models of Molecules!</b> <i>Presented By:</i> Jim Zubricky, Owens Community College, The University of Toledo	<b>Room: Wedgewood</b>



## Conference at a glance - fri. cont.



### Session B (2:15 pm - 3:15 pm)

- B-1 **Math Out of the Box**  
*Presented By:* Sally DeRoo, Carolina Biological Supply Company      Limit 40  
**Room: Ballroom 1**
- B-2 **Explore NASA**  
*Presented By:* Marge Marcy, NASA Glenn Research Center      **Room: Ballroom 2**
- B-3 **Experimentally Understanding Evolution (Learning By Doing It)**  
*Presented By:* Donald Pribor, The University of Toledo      **Room: Ballroom 3**
- B-4 **You Too Can Teach Math or Science Online!**  
*Presented By:* Anne Bullerjahn, Owens Community College  
 Joanne Roehrs, Owens Community College  
 Pam Krompak, Owens Community College      **Room: Ballroom 4**
- B-5 **The Impact of Class Size on Student Learning**  
*Presented By:* Anjali Gray, Lourdes College      **Room: Owens**
- B-6 **NSTA/SECO on the College Campus**  
*Presented By:* D. Michael Waggoner, The University of Toledo  
 Jackie Must, The University of Toledo      **Room: Parlor A**
- B-7 **UT: Transforming Science and Mathematics Teacher Recruitment, Preparation and Retention**  
*Presented By:* Charlene Czerniak, The University of Toledo  
 Rebecca Schneider, The University of Toledo  
 Janet Struble, The University of Toledo  
 Mark Templin, The University of Toledo      **Room: Parlor B**
- B-8 **Linking Literary Genres and Math Concepts**  
*Presented By:* Cherie Hunter, Monroe County Intermediate School District      Limit 30  
**Room: Steuben**
- B-9 **A Modest Proposal for Those Who Cancel Fractions**  
*Presented By:* Donald Czarcinski, Lourdes College      **Room: Waterford**
- B-10 **ORC: Your Source for Best Practice Science Resources**  
*Presented By:* Terry Shiverdecker, Ohio Resource Center      **Room: Wedgewood**





## Conference at a glance - fri. cont.

### Session C (3:30 pm - 4:30 pm)

- C-1 **STC: Changes** Limit 40

*Presented By:* Sally DeRoo, Carolina Biological Supply Company

**Room: Ballroom 1**

- C-2 **What do Geckos, Bandages, and TVs Have In Common?**

*Presented By:* Carin Helfer, Akron Global Polymer Academy  
Charles Parson, Akron Global Polymer Academy  
Justin Molenaur, Akron Global Polymer Academy

**Room: Ballroom 2**

- C-3 **Abbot and Costello Take an Online Course: Who's on First?**

*Presented By:* Debra Gallagher, Bowling Green State University  
Barbara Moses, Bowling Green State University

Limit 40

**Room: Ballroom 3**

- C-4 **They Can "Do" the Algebra, But Do They UNDERSTAND It?**

*Presented By:* Daniel Brahier, Bowling Green State University

**Room: Ballroom 4**

- C-5 **Energy 101**

*Presented By:* Sue Tenney, Ohio Energy Project

Limit 24

**Room: Owens**

- C-6 **It's Not Just About Chemistry Anymore**

*Presented By:* Edith Preciosa Klingberg, The University of Toledo  
Brenda Snyder, The University of Toledo

**Room: Parlor A**

- C-7 **"It's Not Your Fault"**

*Presented By:* Andrea Milner, The University of Toledo  
Raymond Heitger, Bowling Green State University

**Room: Parlor B**

- C-8 **Exploring Inverse Functions with Tracing Paper**

*Presented By:* Courtney Nagle, Penn State University

**Room: Steuben**

- C-9 **Using Technology to Promote Student Engagement**

*Presented By:* Judy Lambert, The University of Toledo

**Room: Waterford**

- C-10 **Building a Presence (BaP) for Science in Ohio**

*Presented By:* Mary Lightbody, Otterbein College, NSTA

**Room: Wedgewood**



# Conference at a glance - Sat.

## Session D (8:15 am – 9:15 am)

### D-1 Awesome Geometry Fun!

*Presented By:* Janet Emerine, Bowling Green State University

**Room: Ballroom 1**

### D-2 The ABC's of Assessment

*Presented By:* Mark Templin, The University of Toledo

Limit 25

**Room: Ballroom 2**

### D-3 The Gresser Function and What I, the Instructor, Learned in Calculus Class

*Presented By:* Raymond Heitger, Bowling Green State University

**Room: Ballroom 3**

### D-4 Opportunities for Earth Science Training Through the American Meteorological Society

*Presented By:* Phillip Lacey, American Meteorological Society

**Room: Ballroom 4**

### D-5 Utilization of Online/Hybrid Course Formats in Undergraduate Science Education

*Presented By:* Craig Warren, Lourdes College

**Room: Owens**

### D-6 Healthy Water, Healthy People (HWHP)

*Presented By:* Dennis Clement, Ohio Environmental Protection Agency

Limit 20

**Room: Parlor A**

### D-7 P.H.Y.S.I.C.S.: A Collaborative Experience

*Presented By:* Kim Cortez, Arlington Local School, COSMOS  
Carey Roehm, Arlington Local School

Limit 20

**Room: Parlor B**

### D-8 Magnetism for Early Childhood Students

*Presented By:* Stephen Van Hook, Bowling Green State University

Limit 30

**Room: Steuben**

### D-9 Successfully Teaching Mathematics in Predominantly African-American Classrooms

*Presented By:* William Thomas, The University of Toledo  
Su Breymaier, TPS Lincoln Academy for Boys

**Room: Waterford**

### D-10 Modeling in Science Education

*Presented By:* Greg Hartzler, Wapakoneta City Schools,  
COSMOS

**Room: Wedgewood**





## Conference at a glance - sat. cont.

### Session E (9:30 am – 10:30 am)

- |      |                                                                                                                                                                                                               |                                   |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| E-1  | <b>Spatial Visualization for Younger Students: How Cool!</b><br><i>Presented By:</i> Janet Emerine, Bowling Green State University                                                                            | <b>Room: Ballroom 1</b>           |
| E-2  | <b>The New Look of Stone Lab</b><br><i>Presented By:</i> Lyndsey Manzo, Stone Laboratory                                                                                                                      | <b>Room: Ballroom 2</b>           |
| E-3  | <b>Physical Science: No Special Equipment Needed!</b><br><i>Presented By:</i> Christie Pinney, Fairview High School<br>Elizabeth McCullough, Olentangy Liberty High School                                    | <b>Room: Ballroom 3</b>           |
| E-4  | <b>Using Webquests in the Classroom and Beyond</b><br><i>Presented By:</i> Karen Menard, Toledo Metroparks                                                                                                    | <b>Room: Ballroom 4</b>           |
| E-5  | <b>Shakes and Eruptions</b><br><i>Presented By:</i> Mary Faw, Bowling Green State University, PRISM<br>Nancy Scott, Bowling Green State University, PRISM<br>Mari Tate, Bowling Green State University, PRISM | <b>Room: Owens</b>                |
| E-6  | <b>"I Really Do Study"</b><br><i>Presented By:</i> Debra Bercher, Lourdes College                                                                                                                             | Limit 30<br><b>Room: Parlor A</b> |
| E-7  | <b>The Chemistry of Art</b><br><i>Presented By:</i> Elizabeth Wise, Lourdes College                                                                                                                           | Limit 20<br><b>Room: Parlor B</b> |
| E-8  | <b>From Natural Disasters to Sports: Teaching With the News</b><br><i>Presented By:</i> Debby Geyer, The Toledo Blade                                                                                         | Limit 30<br><b>Room: Steuben</b>  |
| E-9  | <b>Space Quest</b><br><i>Presented By:</i> Robert Cupp, Leipsic High School                                                                                                                                   | <b>Room: Waterford</b>            |
| E-10 | <b>Great Biology Collections: How To Make One On a Shoestring Budget</b><br><i>Presented By:</i> Brenda Leady, The University of Toledo                                                                       | <b>Room: Wedgewood</b>            |



## Conference at a glance - sat. cont.

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### **Session F (10:45 am – 11:45 am)**

- |      |                                                                                                                                                                                  |                                     |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| F-1  | <b>Technology &amp; Information Literacy - Primary and Secondary Sources</b><br><i>Presented By:</i> Jean Stoner, TRECA Digital Academy                                          | Limit 48<br><b>Room: Ballroom 1</b> |
| F-2  | <b>IPY: Cool Science-Hot Topics</b><br><i>Presented By:</i> Louise Huffmann, IPY International Outreach,<br>Education Steering Committee<br>Jenny Baesman, Kent State University | <b>Room: Ballroom 2</b>             |
| F-3  | <b>Experimentally Understanding Evolution (Learning By Doing It)</b><br><i>Presented By:</i> Donald Pribor, The University of Toledo                                             | <b>Room: Ballroom 3</b>             |
| F-4  | <b>The Science of Bio-products: Food and Fuel in the Future</b><br><i>Presented By:</i> Jeanne Gogolski, Ohio Soy Bean Council<br>Carol Warkentien, Ohio Soy Bean Council        | <b>Room: Ballroom 4</b>             |
| F-5  | <b>Planting Seeds of Science in Growing Minds</b><br><i>Presented By:</i> Diane Thurber, Toledo Botanical Gardens<br>Crystal Taylor, Toledo Botanical Gardens                    | Limit 24<br><b>Room: Owens</b>      |
| F-6  | <b>Inquiry Geology and the Pet Rock</b><br><i>Presented By:</i> Adam Lark, Bowling Green State University, PRISM<br>Robyne Kramp, Bowling Green State University, PRISM          | <b>Room: Parlor A</b>               |
| F-7  | <b>Using Analogies to Learn about Algebraic Expressions</b><br><i>Presented By:</i> Ryan Vigus, Bowling Green State University                                                   | <b>Room: Parlor B</b>               |
| F-8  | <b>Oak Openings-Spread the Word and the Seeds</b><br><i>Presented By:</i> Marya Czech, Lourdes College<br>Robin Ford Parker, Lourdes College                                     | Limit 30<br><b>Room: Steuben</b>    |
| F-9  | <b>Painting by Numbers</b><br><i>Presented By:</i> Paul Hewitt, The University of Toledo                                                                                         | <b>Room: Waterford</b>              |
| F-10 | <b>Building a Presence (BaP) for Science in Ohio</b><br><i>Presented By:</i> Mary Lightbody, Otterbein College, NSTA                                                             | <b>Room: Wedgewood</b>              |

### **Lunch (11:45 am - 12:30 pm)**

*Pick up Lunch in Brasserie and eat in you next session room*





## Conference at a glance - sat. cont.

### Session G (12:45 pm – 2:45 pm)

#### G-1 Participation in Science Fairs is Fun and Rewarding... You Have To Be Kidding!

*Presented By:* Mark Camp, The University of Toledo  
Mikell Lynne Hedley, The University of Toledo  
Janet Struble, The University of Toledo

**Room: Ballroom 1**

#### G-2 Preparing Students for the Ohio Achievement Tests in Science

*Presented By:* Cathy Holmes, Ohio Department of Education  
Sarah Woodruff, Ohio Department of Education

**Room: Ballroom 2**

#### G-3 Images from Space

*Presented By:* Marge Marcy, NASA Glenn Research Center

Limit 40

**Room: Ballroom 3**

#### G-4 JASON Expedition

*Presented By:* Andy Kazee, JASON in Ohio  
Marilyn Zielinski, Toledo Lucas County Public Library  
Kathy Kwiatkowski, Case Western Reserve University

Limit 64

**Room: Ballroom 4**

#### G-5 A Day in Space: Linking Content, NASA, and Students

*Presented By:* Julie Muffler, Challenger Learning Center of Lucas County

Limit 25

**Room: Owens**

#### G-6 Helpful, Special (Often Hidden), Features on the TI-83/84 Grapher

*Presented By:* Duane Bollenbacher, Bluffton University

Limit 30

**Room: Parlor A**

#### G-7 Using Research to Improve Learning in a Junior-level University Mechanics Course:

##### Investigating Student Understanding of Oscillations

*Presented By:* Bradley Ambrose, Grand Valley State University

Limit 20

**Room: Parlor B**

#### G-8 Where Do We Grow From Here? Lessons on Population and Carrying Capacity

*Presented By:* Debra Gallagher, Bowling Green State University

Limit 30

**Room: Steuben**

#### G-9 Hmm....I wonder what will happen if I do THIS?

*Presented By:* Michelle Shafer, Bowling Green State University,  
NWO-COSMOS

Limit 30

**Room: Waterford**

#### G-10 Explore the Science of the Oil and GAS Industry

*Presented By:* Carol Warkentien, Ohio Oil & Gas Energy Education Project  
Jeanne Gogolski, Ohio Oil & Gas Energy Education Project

**Room: Wedgewood**

**All Completed Raffle Tickets Must Be Turned In To The Check-in Desk by 3:00 pm**



## Conference at a glance - sat. cont.

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### Session H (3:00 pm – 5:00 pm)

#### H-1 Students Show What They Know

*Presented By:* Janet Struble, The university of Toledo

Limit 30

**Room: Ballroom 1**

#### H-2 Autumn-into-Winter...Seasonal Science Paints an Ohio Learning Perspective

*Presented By:* Linda Penn, Lourdes College Life Lab  
Susan Gioiella, Lourdes College Life Lab  
Marge Malinowski, Lourdes College Life Lab

**Room: Ballroom 2**

#### H-3 Radiation Experiments with a Free Geiger Counter

*Presented By:* Larry Grime, American Nuclear Society  
Dave Briden, American Nuclear Society  
Paul Williams, American Nuclear Society

Limit 40

**Room: Ballroom 3**

#### H-4 Natural Inquirer: Inquiring into Technology, Reading Comprehension, and Environmental Science

*Presented By:* Safiya Samman, USDA Forest Service

**Room: Ballroom 4**

#### H-5 Rocking Through the Ages—Where You Can Find Rocks, Minerals, and Fossils in Northwest Ohio and Southeast Michigan

*Presented By:* Mark Camp, The University of Toledo

Limit 24

**Room: Owens**

#### H-6 The Physics of Cell Phones and Wireless Communications

*Presented By:* Dave Simmons, St. John's Jesuit High School  
Scott Zura, St. John's Jesuit High School

Limit 24

**Room: Parlor A**

#### H-7 Thinking Like a Scientist: An Inquiry Classroom Model

*Presented By:* Michelle Leow Klinger, COSI Toledo

Limit 24

**Room: Parlor B**

#### H-8 Technology Enhanced Elementary and Middle School Science (TEEMSS)

*Presented By:* Carolyn Staudt, The Concord Consortium

Limit 28

**Room: Steuben**

#### H-9 High Priced Scientific Equipment Created Cool & Cheap

*Presented By:* Stephen Lease, Frank Elementary School

Limit 30

**Room: Waterford**

#### H-10 Project EXCITE's Problem-Based Learning Odysseys: A Voyage Worth Taking!

*Presented By:* Bethany Ash, Bowling Green State University  
Alison Ross, Bowling Green State University

Limit 30

**Room: Wedgewood**

**Pick up Raffle Prizes Between 5:00 pm - 5:30 pm at the Check-in Area**





## **FRIDAY SESSIONS:**

### *Abbreviations Used:*

M: Mathematics	O: Other	Ped: Pedagogy
E/S S: Earth/Space Science		LS: Life Science
PS: Physical Science		T: Technology

### **Session A (1:00 pm - 2:00 pm)**

**A1**

#### **STC/MSTM: Human Body Systems**

**(Limit 40)**

Get your blood pumping and your juices flowing with this workshop exploring some of the systems of the human body: circulatory, respiratory, digestive, and musculoskeletal. This STC/MSTM module, Human Body Systems, leads participants in a hands-on journey through the human body. A brief overview of the STC/MSTM curriculum will be provided at the beginning of this session. Science and Technology Concepts for Middle Schools TM was developed by the NSRC and is published and distributed exclusively by Carolina Biological Supply Company.

*Presented by:* Sally DeRoo, Carolina Biological Supply Company

*Grade Levels:* 7-9 (LS)

*Room:* Ballroom 1

**A2**

#### **Zoos: Menageries and Math**

**(Limit 50)**

What is the average stride of an elephant? How much meat does a tiger eat? This session will explore some of the exciting ways teachers can integrate math skills and concepts with zoos, and then use these real-world applications with students. Teachers (and future teachers, too) will explore ways students can blend science and math proficiencies to investigate and understand animal forms and functions and gain insights into the multitude of mathematics used in zoos and the natural world. Polar bear paw measurements, giraffe graphs, and metric conversions are just a few things on the agenda that will add up to calculated fun. You'll also get to preview our newest Discovery Box "ZOOS: Math and Measurement". Live animals may be added for extra fun!

*Presented by:* Linda Calcamuggio, Toledo Zoo

*Grade Levels:* Pk-3, Pre-service (M, LS)

*Room:* Ballroom 2

**A3**

#### **Tales From the Whale**

This presentation is for grades 1-5 with emphasis on matching new trade books to your science and math curriculum using state standards as a guide. The presentations will include both fiction and non fiction titles to make science and math fun and exciting. Come and share an hour and learn what is new and exciting.

*Presented by:* Marcia Kaplan, Whale of a Tale

*Grade Levels:* 1-5 (M, E/S S. LS. PS)

*Room:* Ballroom 3

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## A4

### Natural Inquirer: Inquiring into Environmental Science

Are you and your students natural inquirers? If so, come learn about the Natural Inquirer, an environmental science journal, for middle school and high school students! The journal is a free educational resource produced by the USDA Forest Service that is based on peer-reviewed, contemporary Forest Service research. Each edition contains activities and a lesson plan as well as other resources available on the web site: [www.naturalinquirer.usda.gov](http://www.naturalinquirer.usda.gov). Come join us to learn more about this fantastic resource and receive free copies of the journal!

*Presented by:* Don Howlett, USDA Forest Service

*Grade Levels:* 6-12 (E/S S)

*Room:* Ballroom 4

## A5

### Professors Analyzing Their Teaching

Professors at The University of Toledo will share their experiences of being involved in "lesson study", a UT<sup>3</sup> (UToledo.UTeach.UTouch the Future) project. A "lesson study" is a teaching improvement process in which faculty work together to plan a lesson, observe the lesson being taught, analyze what took place in the classroom, and then refine the lesson. Come and learn about this process.

*Presented by:* George Shirk, The University of Toledo

Janet Struble, The University of Toledo

Alison Spongberg, The University of Toledo

Vernon Brown, The University of Toledo

*Grade Levels:* College (Ped)

*Room:* Owens

## A6

### Science, Mathematics and the Toledo Museum of Art

Math and science are everywhere, including the collection at the Toledo Museum of Art. Images of botany, the environment, ecosystems, and more fill our galleries. Balance and motion from Physics are visually depicted in paintings and kinesthetic sculpture. From basic shapes to the golden triangle, to grids creating modern abstractions, students will be amazed to discover that the numbers they crunch in class are applied by artists in a variety of ways. Students will learn about the role of science and math in art on an exciting tour at the Toledo Museum of Art.

*Presented by:* Carolyn Rozko, Toledo Museum of Art

*Grade Levels:* K-12 (M, LS, PS)

*Room:* Parlor A





## A7

### OhioView SATELLITES-Students, Teachers, Scientists using Geospatial Technologies

Discover cutting-edge geospatial technologies (satellite remote sensing, GPS, GIS) and how to bring excitement to your classroom through inquiry-based, fun, simple activities, hands-on GPS and InfraRed Thermometer (IRT) instruments, and a 'real' science project, the Surface Temperature Research Project, through the GLOBE program. The 2006-2007 Campaign's focus is on the International Polar Year (IPY). Students will create a poster reflecting their inquiry-based IPY investigation that will be shared at the inaugural SATELLITES Conference hosted at the Great Lakes Science Center in Cleveland. Geospatial technology is the 3rd growing career path in the USA (Gewin, 2004). OhioView recognizes an incredible opportunity to prepare our youth for direct entry into the geospatial industry or for advanced training. Please come and see what SATELLITES is all about!

*Presented by:* Terri Benko, The University of Toledo

Kevin Czajkowski, The University of Toledo

Mandy Munro-Stasiuk, Kent State University

*Grade Levels:* 7-12, Pre-service, College (M, E/S S, T)

*Room:* Parlor B

## A8

### Track Tales - Becoming a Nature Detective

(Limit 25)

The earth is covered in tracks and each track tells a story about who or what passed by: animals, the movement of plants, which way the wind was blowing at a given time, the movement of water, and so much more. The study of tracks leads to a greater awareness of the vast amount of life around a person that largely goes unnoticed in our busy lives. Tracking is more than identifying the owner of the track; it brings in the topics of mathematics, geology, botany, animal studies, the concept of patterns, and even an introduction to topographic maps. Most students find tracks to be fascinating and that interest can be a window into a wide variety of lessons.

*Presented by:* Eileen Sawyer, Bowling Green State University

*Grade Levels:* 4-9 (LS)

*Room:* Steuben

## A9

### Let's Get Them Talking! Discourse in the Math Classroom

(Limit 30)

We want students to talk with each other about mathematics as well as analyze the mathematical thinking and strategies of others, but how do we facilitate this? What does this look like and sound like in a mathematics classroom? Let's enhance your experiences and expertise with tips, strategies, and a framework from articles published by the National Council of Teachers of Mathematics to get your students talking about their mathematical thinking. The presentation will be interactive and participants will leave with handouts.

*Presented by:* Julie Nurnberger-Haag, Bowling Green State University

*Grade Levels:* Pk-9 (M)

*Room:* Waterford

**A10****Physical 3-D Models of Molecules!**

Have you ever had difficulty in a chemistry class because you couldn't picture what the molecules really look like in nature? Have you ever had a hard time trying to teach about how molecules really look like? Well this seminar is for you! This seminar will show you how to use a new type of technology (rapid prototyping) in order to create physical 3D models of molecules!

*Presented by:* Jim Zubricky, Owens Community College, The University of Toledo

*Grade Levels:* 7-12, Pre-service, College (Ped, PS, T)

*Room:* Wedgewood

**Session B (2:15 pm - 3:15 pm)****B1****Math Out of the Box**

(Limit 40)

Results add up with "Math Out of the Box": An Independent Effectiveness Study of the new "Math Out of the Box" Program by Education Testing Service. Achievement gaps close and student's mathematical comprehension increases with "Math Out of the Box", as shown by the results of this DuPont funded study by Education Testing Service. Discover how this program successfully accomplishes these goals with its unique inquiry-based lessons.

*Presented by:* Sally DeRoo, Carolina Biological Supply Company

*Grade Levels:* Pk-6 (M)

*Room:* Ballroom 1

**B2****Explore NASA**

Discover NASA resources and opportunities available to educators from NASA that will help to inspire your students. Resources are connected to the National Standards. How to become a NASA Explorer School will be highlighted.

*Presented by:* Marge Marcy, NASA Glenn Research Center

*Grade Levels:* 4-12 (E/S S)

*Room:* Ballroom 2

**B3****Experimentally Understanding Evolution (Learning By Doing It)**

Creative learning in people who have developed logical, conceptual thinking involves a transformation from an old point of view to the self-awareness that it no longer answers many relevant questions. Such as a person may be able to endure the chaos of not knowing or not understanding a new perspective and the repeated frustrations of trial and error proposing new ideas until he/she constructs a new point of view. This is an instance of evolution that may be summarized as order, chaos, and trial and error leading to a new order. Thus, the experience of creative learning is experimentally understanding evolution.

*Presented by:* Donald Pribor, The University of Toledo

*Grade Levels:* Pre-service, College (Ped)

*Room:* Ballroom 3





## B4 You Too Can Teach Math or Science Online!

There seems to be increasing interest in online courses. We will present our experiences teaching science and math classes online. We will provide advice on potential pitfalls of this mode of instruction as well as best practices we have learned along the way.

*Presented by:* Anne Bullerjahn, Owens Community College

Joanne Roehrs, Owens Community College

Pam Krompak, Owens Community College

*Grade Levels:* College (M, LS, T)

*Room:* Ballroom 4

## B5 The Impact of Class Size on Student Learning

With more and more colleges and universities offering ever increasing large classes, the impact on student learning will be discussed. Pros and cons of both small and big classes will be discussed.

*Presented by:* Anjali Gray, Lourdes College

*Grade Levels:* 12, College (Ped)

*Room:* Owens

## B6 NSTA/SECO on the College Campus

This presentation is geared toward the pre-service teacher, to show them the benefits of belonging to a professional organization such as NSTA and SECO. Co-Presenters are Jackie Must and D. Michel Waggoner Out going President and Vice President of the University of Toledo Chapter of NSTA/SECO. Jackie and Mike worked together on the organization and writing of the Constitution and Bylaws for the chapter. The presentation will help guide other pre-service teachers in organizing chapters on their particular college campus if they do not have one now.

*Presented by:* D. Michael Waggoner, The University of Toledo

Jackie Must, The University of Toledo

*Grade Levels:* Pre-service, College (O)

*Room:* Parlor A

## B7 UT<sup>3</sup>: Transforming Science and Mathematics Teacher Recruitment, Preparation and Retention

UT<sup>3</sup> is designed to recruit and prepare students to become highly qualified urban science and mathematics teachers, and then support them in their first three years of their teaching. UT<sup>3</sup> is a partnership among UT Colleges (Education, Arts and Sciences, Engineering, and Pharmacy); Toledo Public Schools and Central City Catholic Schools; research teams; various UT centers; and supporting community partners. The UT<sup>3</sup> program is designed to create an institution-wide commitment to high quality teacher preparation that includes significant policy and practice changes supported by key leaders, which will result in permanent

changes making teacher education a central mission of UT. In this session, participants will learn about our comprehensive recruiting strategies (including undergraduate and graduate level scholarships and internships), innovative programming with Master Teachers, uses of technology, and induction year activities.

*Presented by:* Charlene Czerniak, The University of Toledo

Rebecca Schneider, The University of Toledo

Janet Struble, The University of Toledo

Mark Templin, The University of Toledo

*Grade Levels:* Pre-service, College (O)

*Room:* Parlor B

## B8

### Linking Literary Genres and Math Concepts

(Limit 30)

This session will examine quality literature to further understand mathematics. Linking stories and math concepts can help students construct meaning and improve problem solving techniques and strategies. Book List and handouts will be provided to participants.

*Presented by:* Cherie Hunter, Monroe County Intermediate School District

*Grade Levels:* Pk-6, Pre-service (M)

*Room:* Steuben

## B9

### A Modest Proposal for Those Who Cancel Fractions

This is an examination of the erroneous thinking that results from teaching students to reduce fractions to lowest terms by a process known as "cancellation". It explains the dangers that arise from teaching process instead of mathematics. It includes a close examination of the process by which students are taught to add fractions with unequal denominators.

*Presented by:* Donald Czarcinski, Lourdes College

*Grade Levels:* 4-9 (M, Ped)

*Room:* Waterford

## B10

### ORC: Your Source for Best Practice Science Resources

This presentation will demonstrate the quality science resources found on the Ohio Resource Center's website. Participants will engage in a brief science activity taken from one of our resources, and will learn how to locate and organize resources available through ORC. ORC's lessons are peer-reviewed and all resources are aligned to Ohio's Academic Content Standards for Science. Resources included in the ORC collection represent best practices in science education. All resources are freely available. Handouts including a Quick-Start Guide and information about ORC's projects will be available.

*Presented by:* Terry Shiverdecker, Ohio Resource Center

*Grade Levels:* Pk-12, Pre-service, College (E/S S, LS, PS)

*Room:* Wedgewood





### **Session C (3:30 pm - 4:30 pm)**

## C1

#### **STC: Changes**

(Limit 40)

Join us for an interactive exploration into the 2nd grade Science and Technology for Children® unit Changes. Exciting activities lead the students through the world of physical and chemical changes. A brief overview of the STC® curriculum will be provided at the beginning of this session. Science and Technology for Children® was developed by the National Science Resources Center and is exclusively published and distributed by Carolina Biological Supply Company.

*Presented by:* Sally DeRoo, Carolina Biological Supply Company

*Grade Levels:* Pk-3 (PS)

*Room:* Ballroom 1

## C2

#### **What do Geckos, Bandages, and TVs Have In Common?**

Polymers are a class of materials that have infiltrated our lives to the extent that we could not survive without them. They are found in things as diverse as geckos, bandages, and TVs, as well as the cars we drive, the clothes we wear, and the food we eat. Polymers even make up part of our bodies! Participants will learn about free online resources that they can use immediately in their classrooms to meet the Ohio Science Academic Content Standards.

*Presented by:* Carin Helfer, Akron Global Polymer Academy

Charles Parson, Akron Global Polymer Academy

Justin Molenaar, Akron Global Polymer Academy

*Grade Levels:* Pk-12 (PS)

*Room:* Ballroom 2

## C3

#### **Abbot and Costello Take an Online Course: Who's on First?**

(Limit 40)

Abbott and Costello will discuss the who's, the what's, and the how's of online professional development. Bud and Lou will provide a glimpse of video clips of mathematics classrooms, an online discussion group, and a look at who successfully participates (and reaches first base) in online professional development.

*Presented by:* Debra Gallagher, Bowling Green State University

Barbara Moses, Bowling Green State University

*Grade Levels:* 4-9 (M, Ped, T)

*Room:* Ballroom 3

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**C4****They Can "Do" the Algebra, But Do They UNDERSTAND It?**

In this session, we will explore examples of problems typically studied in middle and high school algebra courses (or units) and compare the skills involved in solving the problems versus the conceptual development of mathematical ideas. For example, many students can solve an equation but do not understand the geometric interpretation of finding the solution. Or they can find the slope of a line but do not understand the real world meaning of the coefficient. Likewise, students can often simplify an expression but cannot explain why alternate ways of expressing the solution also make sense. Practical suggestions for teaching algebra for understanding will be presented.

*Presented by:* Daniel Brahier, Bowling Green State University

*Grade Levels:* 7-12 (M)

*Room:* Ballroom 4

**C5****Energy 101**

(Limit 24)

Explore the science of energy using hands-on activities and experiments. Learn classroom activities to present the ten sources of energy, electricity, transformations of energy and energy efficiency. All participating teachers will receive a free packet of grade level specific curriculum. Appropriate for 5th-7th grade science and technology teachers.

*Presented by:* Sue Tenney, Ohio Energy Project

*Grade Levels:* 4-7 (PS)

*Room:* Owens

**C6****It's Not Just About Chemistry Anymore**

You have done everything you can to prepare your students for college level courses. They have studied well and have scored high on your exams. But are they really ready? Have you given them ALL of the skills that they need to pass "freshmen chemistry"? This presentation will briefly take you into a general chemistry class at UT and let you experience firsthand what your students will encounter on their first day of classes, both in lecture and in the laboratory. Common student errors and skills that are commonly lacking will be presented, and how to better prepare them for college chemistry will be discussed. If any of your students are going to be doctors, pharmacists, engineers, science educators, nurses, or any other field that is science related, they need this information.

*Presented by:* Edith Preciosa Klingberg, The University of Toledo

Brenda Snyder, The University of Toledo

*Grade Levels:* 7-12 (PS)

*Room:* Parlor A





## C7 "It's Not Your Fault"

In spite of many problems in education today, the mathematics and science communities are bending over backwards to help teachers educate all children in the United States. We will present evidence to show that placing the blame on teachers and schools is misdirected.

*Presented by:* Andrea Milner, The University of Toledo  
Raymond Heitger, Bowling Green State University

*Grade Levels:* 10-12 (Ped)

*Room:* Parlor B

## C8 Exploring Inverse Functions with Tracing Paper

This presentation introduces an innovative way of teaching students about inverse functions using tracing paper. The presentation will include ideas for teaching students about the Horizontal Line Test, Inverse Trigonometric Functions, and derivatives of inverse functions, making it applicable to Trigonometry, Pre-Calculus and Calculus teachers.

*Presented by:* Courtney Nagel, Penn State University  
*Grade Levels:* College (M)

*Room:* Steuben

## C9 Using Technology to Promote Student Engagement

Exciting technologies such as podcasting, virtual reality, and geographic information systems can promote critical thinking, interactivity, problem solving, creativity, and personal expression in students. The presenter will introduce and explain the hardware and software needed to use these technologies, exhibit student projects created with them; and discuss how these tools can support the Ohio standards-based curriculum in a variety of content areas. Packets of resources will be provided to participants to assist them in further exploration of the technologies.

*Presented by:* Judy Lambert, The University of Toledo  
*Grade Levels:* K-12, Pre-service, College (T)

*Room:* Waterford

## C10 Building a Presence (BaP) for Science in Ohio

Building a Presence for Science has been launched in Ohio, and teachers who are willing to become part of the effort are encouraged to come to this session. Learn how BaP has ended the isolation of science teachers in other states by connecting teachers directly and electronically with each other. Learn about how you can become involved as a Point of Contact for your school and/or a Key Leader in your community. All participants will receive handouts, and examples of electronic communications ("e-blasts") that have been sent through the network this year. The BaP State Coordinator for Ohio will lead this session, and will provide an introduction to this exciting new electronic network; do join us because we need YOU to make this successful.

*Presented by:* Mary Lightbody, Otterbein College, NSTA  
*Grade Levels:* Pk-12, College (T)

*Room:* Wedgewood

## SATURDAY MORNING SESSIONS

### Abbreviations Used:

M: Mathematics O: Other  
 E/S S: Earth/Space Science  
 PS: Physical Science

Ped: Pedagogy  
 LS: Life Science  
 T: Technology

### Session D (8:15 am – 9:15 am)

**D1**

#### Awesome Geometry Fun!

Geometry activities to delight the younger ones! Hands-on, minds-on activities to connect the Ohio Academic Content and Process Standards to the student's world!

*Presented by:* Janet Emerine, Bowling Green State University

*Grade Levels:* Pk-3 (M)

*Room:* Ballroom 1

**D2**

#### The ABC's of Assessment

(Limit 25)

Are you concerned about your students passing state proficiencies and the OGT? Come find out how effective assessment techniques throughout the year can lead your students to success in high stakes tests. Handouts will be provided.

*Presented by:* Mark Templin, The University of Toledo

*Grade Levels:* Pk-12 (Ped)

*Room:* Ballroom 2

**D3**

#### The Gresser Function and What I, the Instructor, Learned in Calculus Class

I found that the student's inability to do a (what I thought was a straight forward) calculus graphing problem had nothing to do with the calculus, but with not being able to effectively use the calculator. I will discuss the problem and how we got around the difficulties.

*Presented by:* Raymond Heitger, Bowling Green State University

*Grade Levels:* College (T)

*Room:* Ballroom 3





## D4

### Opportunities for Earth Science Training Through the American Meteorological Society

Come find out about The American Meteorological Society's Educational Programs. AMS sponsors a variety of residential and on-line training programs for science teachers who concentrate on the earth sciences. These programs offer FREE graduate credit to all teachers who have successfully completed each course. Special emphasis is given to weather, the oceans, and the global water cycle.

*Presented by:* Phillip Lacey, American Meteorological Society

*Grade Levels:* 4-12 (E/S S)

*Room:* Ballroom 4

## D5

### Utilization of Online/Hybrid Course Formats in Undergraduate Science Education

The utilization of hybrid and online formats in undergraduate science education can be successful if appropriate resources are devoted to the program. There have been many recent advances in the technology used to deliver these types of courses. I propose to give the participants the tools they need to begin introducing these technologies in their undergraduate science courses.

*Presented by:* Craig Warren, Lourdes College

*Grade Levels:* College (LS, T)

*Room:* Owens

## D6

### Healthy Water, Healthy People (HWHP)

(Limit 20)

Session will involve participants in learning about water quality and the tools they will need to teach lessons on this issue. All activities will be hands-on and participants will be given (value \$30.00) one set of HWHP Curriculum Guides for their use.

*Presented by:* Dennis Clement, Ohio EPA

*Grade Levels:* 4-12, Pre-service, College (LS, PS)

*Room:* Parlor A

## D7

### P.H.Y.S.I.C.S.: A Collaborative Experience

(Limit 20)

P.H.Y.S.I.C.S. (Physics and Chemistry students Helping Young Scientists by Incorporating Content Standards) is a program designed to help 4th-6th grade teachers in their teaching of Physical Science by collaborating with a highly qualified science teacher, aided by high school students. This program utilizes 5-E Model lessons packed with instructions, demonstrations, and labs for common weakness areas among elementary teachers. Complete lesson plans will be shared with participants.

*Presented by:* Kim Cortez, Arlington Local School, COSMOS

Carey Roehm, Arlington Local School

*Grade Levels:* 4-6, 10-12 (PS)

*Room:* Parlor B



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## D8

### Magnetism for Early Childhood Students

(Limit 30)

I will share a set of content-rich magnetism lessons for early childhood students that also incorporate important science process skills. Have fun with magnets and learn a fun magnet song, too!

*Presented by:* Stephen Van Hook, Bowling Green State University

*Grade Levels:* Pk-3 (PS)

*Room:* Steuben

## D9

### Successfully Teaching Mathematics in Predominantly African- American Classrooms

The achievement gap on the Ohio Graduation Test and the Ohio Achievement Tests in mathematics between blacks and whites stands as a silent but powerful witness to society today. Either we must accept that African American children cannot learn mathematics to the same levels as whites or that they are not being taught as effectively as they could be. The presenters will share data, approaches, and activities that have been proven successful with African American children. These activities and approaches have been used successfully in Lincoln Academy for Boys, one of the nations few all boys elementary schools, and other schools in Toledo and other urban areas. Come, participate, and bring ideas that work for you.

*Presented by:* William Thomas, The University of Toledo

Su Breymaier, TPS Lincoln Academy for Boys

*Grade Levels:* 4-9 (M)

*Room:* Waterford

## D10

### Modeling in Science Education

Wapakoneta High School implemented the recognition of and increased utilization of modeling in their science instruction during the 2005-2006 school year. The results are in. Modeling had a positive effect on students and teachers alike. We would like to share our process and results to begin additional conversation between schools in Northwest/Western Ohio on this topic.

*Presented by:* Greg Hartzler, Wapakoneta City Schools, COSMOS

*Grade Levels:* 10-12 (Ped, E/S S, LS, PS, T)

*Room:* Wedgewood





### **Session E (9:30 am – 10:30 am)**

**E1**

#### **Spatial Visualization for Younger Students: How Cool!**

Spatial activities connecting the Content and Process Standards to the child's world! Activities that can be adapted to any early childhood classroom and used immediately!

*Presented by:* Janet Emerine, Bowling Green State University

*Grade Levels:* Pk-3 (M)

*Room:* Ballroom 1

**E2**

#### **The New Look of Stone Lab**

Looking for ways to increase your science content knowledge while acquiring new teaching strategies? Interested in professional development that is active, hands-on, and easily integrated into your classroom? Come see what OSU's Stone Laboratory has to offer for formal and informal educators, as well as students (grades 4-12). Get information on the newest opportunities, including technology-infused courses at the lake, online short courses, and teacher-created, standards-based curricular materials. Find out how your students can participate in aquatic sampling cruises, post-secondary opportunities, and FREE videoconferences.

*Presented by:* Lyndsey Manzo, Stone Laboratory Fellow

*Grade Levels:* 4-12, College (Ped, E/S S, LS)

*Room:* Ballroom 2

**E3**

#### **Physical Science: No Special Equipment Needed!**

A variety of physical science activities will be presented. What will set these activities apart from others is that these activities use materials that can be found at the local grocery, home improvement or department store. Eliminating the need for specialty equipment allows all teachers to do hands on science throughout the year. Activities can be modified for use in all grade levels.

*Presented by:* Christie Pinney, Fairview High School

Elizabeth McCullough, Olentangy Liberty High School

*Grade Levels:* 7-12 (PS)

*Room:* Ballroom 3

**E4**

#### **Using Webquests in the Classroom and Beyond**

This session will explore the basics of a webquest and interesting ways it can be used to link classroom technology with other disciplines and community resources. Learn how a webquest can successfully incorporate your next field trip.

*Presented by:* Karen Menard, Toledo Metroparks

*Grade Levels:* 4-9 (E/S S, LS, T)

*Room:* Ballroom 4

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## E5 Shakes and Eruptions

Teachers will see inquiry-based labs as well as writing activities for use in teaching earthquakes and volcanoes to intermediate grade students.

*Presented by:* Mary Faw, Bowling Green State University, PRISM  
Nancy Scott, Bowling Green State University, PRISM  
Mari Tate, Bowling Green State University, PRISM

*Grade Levels:* 4-6 (E/S S)

*Room:* Owens

## E6 "I Really Do Study"

(Limit 30)

I really did study. How many times have teachers heard this statement from students after a poor performance on a test? We'll explore the differences between these students and the successful ones and how teachers can move these novices toward becoming experts.

*Presented by:* Debra Bercher, Lourdes College

*Grade Levels:* K-12 (Ped)

*Room:* Parlor A

## E7 The Chemistry of Art

(Limit 20)

The general format of this introductory chemistry course for non-science majors will be described, a min lecture will be presented, and attendees will participate in a class activity. Basic principles of chemistry are applied to the topics of color, paint, paper, clay, glass, metals, photography, and art restoration.

*Presented by:* Elizabeth Wise, Lourdes College

*Grade Levels:* 7-12 (PS)

*Room:* Parlor B

## E8 From Natural Disasters to Sports: Teaching With the News

(Limit 30)

How do we teach students in a world where the amount of information available to them is doubling every two and one-half years? How do we prepare them for careers that are not even imagined today? Discover how to help students use today's news to find relevant information that will enhance your curriculum, bridge the textbook gap and encourage higher-level thinking. Watch the light bulbs go on as students "get" the importance of math, science and technology in everyday life. Hands-on activities and lessons to take with you included in this session.

*Presented by:* Debby Geyer, The Toledo Blade

*Grade Levels:* 7-12 (M, E/S S, LS, PS, T)

*Room:* Steuben





## E9

### Space Quest

Space quest is a hands on learning module that can be used over the course of a nine week period. It addresses a number of state standards in the area of Earth/Space science. The project originated from a presentation I attended at the symposium several years ago that was presented by the Challenger Learning Center. Their module Mars Geology is included in the Space Quest Module.

*Presented by:* Robert Cupp, Leipsic High School

*Grade Levels:* 7-9 (E/S S)

*Room:* Waterford

## E10

### Great Biology Collections: How To Make One On a Shoestring Budget

Do you want your students to experience organisms by touching, holding, feeling them? Color pictures and video are great but the actual organism is better. But most of you have little to no budget for specimens. I'll share 17 years of experience in finding and preserving specimens on a tight budget including skulls, shells, plants, whole animals, etc. I'll bring examples from my own collection to illustrate. If you attended last year, I will have new specimens and techniques to share. I will offer extra organisms from the collection to interested participants.

*Presented by:* Brenda Leady, The University of Toledo

*Grade Levels:* Pk-12, College (LS)

*Room:* Wedgewood

### Session F (10:45 am – 11:45 am)

## F1

### Technology & Information Literacy - Primary and Secondary Sources (Limit 48)

Participants will be introduced to a variety of Internet resources, productivity tools, and multimedia software. Students learn about primary and secondary sources about the Wright Brothers and then create an autobiographical multimedia project. Technology Content Standard 5 - Technology & Information Literacy Information literacy, Internet use, and technology tools to answer questions and expand knowledge. (Understanding Information, Primary/Secondary Sources, Internet Concepts, Searching, Web Site Evaluation, and Research Model.)

*Presented by:* Jean Stoner, TRECA Digital Academy

*Grade Levels:* 4-9 (T)

*Room:* Ballroom 1

## F2 IPY: Cool Science-Hot Topics

As the International Polar Year (IPY) approaches (2007-2009), share significant Polar research as it's happening, and involve your students in the process. Journey to the coldest place on Earth with a teacher who spent a research season in the Dry Valleys of Antarctica. Find out how to create an exciting learning environment that enables students and teachers to learn the process and content of science through connections to on-going scientific research in Antarctica. Participants will receive a packet of activities to use in their classrooms!.

*Presented by:* Louise Huffmann, IPY International Outreach Education  
Steering Committee

Jenny Baesman, Kent State University

*Grade Levels:* Pk-12 (E/S S, LS, PS)

*Room:* Ballroom 2

## F3 Experimentally Understanding Evolution (Learning By Doing It)

Creative learning in people who have developed logical, conceptual thinking involves a transformation from an old point of view to the self-awareness that it no longer answers many relevant questions. Such as a person may be able to endure the chaos of not knowing or not understanding a new perspective and the repeated frustrations of trial and error proposing new ideas until he/she constructs a new point of view. This is an instance of evolution that may be summarized as order, chaos, and trial and error leading to a new order. Thus, the experience of creative learning is experimentally understanding evolution.

*Presented by:* Donald Pribor, The University of Toledo  
*Grade Levels:* Pre-service, College (Ped)

*Room:* Ballroom 3

## F4 The Science of Bio-products: Food and Fuel in the Future

Can biotechnology end world hunger? Are we creating frankenfoods? What is a bio-refinery? Integrate Ohio Science Standards using hands-on activities that illustrate food technology, biotechnology, biofuels and bioproducts. Use the 5 E learning cycle to explore air quality issues and biofuels, bio-power and the Ohio bio products industry. Look for answers to Why is Quik® quick? How can a school bus smell like French Fries? and What is the producer "point of view" on GMOs? Participants will receive several free 8-page activity guides that include web quests, kinesthetic science models, risk-benefit activities and issue-based teaching strategies. The Ohio Soybean Council supports and sponsors science education in Ohio.

*Presented by:* Jeanne Gogolski, Ohio Soy Bean Council  
Carol Warkentien, Ohio Soy Bean Council  
*Grade Levels:* 4-12, Pre-service (E/S S, LS, PS)

*Room:* Ballroom 4





## F5

### Planting Seeds of Science in Growing Minds

(Limit 24)

Do you think the birds and the bees are just for botanists! Is pollen just something that makes you sneeze? Are leaves and seeds nothing more than bothersome clutter on your windshield? It's time to let us get you excited about plant science! We'll lead you through some of the interactive games and inquiry based activities we use at the Toledo Botanical Garden to make our Field Trips and In Class Activities fun and educational! You'll also make and take two hands-on activities to use with your students, and we promise they can't be over or under watered and won't die during winter break! Yes, you can meet those science standards in an interesting and engaging way! Join us as we fertilize our minds and sprout new ideas for your classroom.

*Presented by:* Diane Thurber, Toledo Botanical Gardens

Crystal Taylor, Toledo Botanical Gardens

*Grade Levels:* Pk-6 (LS)

*Room:* Owens

## F6

### Inquiry Geology and the Pet Rock

The pet rock is a classic experiment from many geology units. It takes a rock and has students do experiments to test for certain geological properties using a formulaic lesson plan with a "follow the steps" approach. Our lesson plan takes that idea and puts an inquiry spin on the experiment, paralleling the lesson with an entire geology unit! Students bond with their rock while exploring its properties, and learning everything geology has to offer about their pet rock.

*Presented by:* Adam Lark, Bowling Green State University, PRISM

Robyne Kramp, Bowling Green State University, PRISM

*Grade Levels:* 4-6 (E/S S)

*Room:* Parlor A

## F7

### Using Analogies to Learn about Algebraic Expressions

The power of an analogy is that it can be used to extend previous experiences or knowledge to new situations. The hands-on lesson discussed in this session will combine the power of analogies and the power of inquiry to help students not only learn about algebraic expressions but also increase their ability to reason through algebraic expressions.

*Presented by:* Ryan Vigus, Bowling Green State University

*Grade Levels:* 4-9 (M)

*Room:* Parlor B

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## F8 Oak Openings-Spread the Word and the Seeds

(Limit 30)

Presentation will include geological and ecological history of the Oak Openings region and an overview of current research by area institutions and groups. Participants will become acquainted with indigenous plants and will assemble a tabletop greenhouse for which native seeds will be provided.

*Presented by:* Marya Czech, Lourdes College  
Robin Ford Parker, Lourdes College

*Grade Levels:* 7-12 (LS)

*Room:* Steuben

## F9 Painting by Numbers

We will use simple algebra techniques (linear equations, quadratic functions, graphs, and a bit of trig) to explore how images are captured, displayed, transmitted, and manipulated. These ideas are employed daily on the web, in digital cameras, MRIs, and many other places - maybe even the human brain. These very modern methods are strongly linked to tricks of the trade that artists have used for eons. We will use numbers to make simple paintings - we will become mathematical Picassos.

*Presented by:* Paul Hewitt, The University of Toledo  
*Grade Levels:* 10-12 (M)

*Room:* Waterford

## F10 Building a Presence (BaP) for Science in Ohio

Building a Presence for Science has been launched in Ohio, and teachers who are willing to become part of the effort are encouraged to come to this session. Learn how BaP has ended the isolation of science teachers in other states by connecting teachers directly and electronically with each other. Learn about how you can become involved as a Point of Contact for your school and/or a Key Leader in your community. All participants will receive handouts, and examples of electronic communications ("e-blasts") that have been sent through the network this year. The BaP State Coordinator for Ohio will lead this session, and will provide an introduction to this exciting new electronic network; do join us because we need YOU to make this successful.

*Presented by:* Mary Lightbody, Otterbein College, NSTA  
*Grade Levels:* Pk-12, College (T)

*Room:* Wedgewood

**Lunch (11:45 am - 12:30 pm)**

**Pick up Lunch in Brasserie and eat in you next session room**





## SATURDAY AFTERNOON SESSIONS

### Session G (12:45 pm – 2:45 pm)

#### G1

##### Participation in Science Fairs is Fun and Rewarding... You Have To Be Kidding!

Science Fair participation does not have to be drudgery. Come find out ways to make this experience rewarding to both you and your students. Step by step instructions will be given as to how to navigate the forms. Suggestions will be given on the types of projects that work well. Tips will be given on judging. A suggested timeline will be given that lets you and the students get things done for the Fair without last minute crunches. Science Fair gives the students opportunities to engage in real science inquiry and win awards including scholarships. The presenters have over fifty years of experience in doing Science Fairs so come and see how your students can participate in this opportunity without pain and misery. There will be a question and answer period. Handouts will be provided.

*Presented by:* Mark Camp, The University of Toledo

Mikell Lynne Hedley, The University of Toledo

Janet Struble, The University of Toledo

*Grade Levels:* 7-12, Pre-service (M, E/S S, LS, PS, T)

*Room:* Ballroom 1

#### G2

##### Preparing Students for the Ohio Achievement Tests in Science

So you have given your students the half-length practice test in science...now what? Using the practice test items the Ohio Department of Education will elaborate on cognitive demands to clarify the range of expected learning outcomes in conjunction with the learning cycle to guide student inquiry prescribed in all six standards of the Ohio Academic Content Standards, K-12 Science

*Presented by:* Cathy Holmes, Ohio Department of Education

Sarah Woodruff, Ohio Department of Education

*Grade Levels:* K-12 (E/S S, LS, PS)

*Room:* Ballroom 2

#### G3

##### Images from Space

**(Limit 40)**

Teach mathematics, science, geography and Earth science through Earth images taken from space. Participants will discover where to find images, explore the images and see how they can be used in the classroom to teach various concepts.

*Presented by:* Marge Marcy, NASA Glenn Research Center

*Grade Levels:* 4-12 (M, E/S S, LS, PS, T)

*Room:* Ballroom 3

33

(Limit 64)

**G4****JASON Expedition**

The JASON Expedition was founded eighteen years ago by oceanographer and explorer Dr. Robert Ballard after finding the Titanic. The JASON Expedition is a science education program designed to excite and engage Grade 4-9 students through an inquiry-based curriculum, video supplements and an extensive online gated web-site. Expeditions explore current and ongoing research aligned to National and Ohio State Standards (GLI's). JASON provides an integrated curriculum science investigations, literary novels and technology utilization. Participants will receive an overview of the JASON Expedition components; participate in selected hands-on activities from "Disappearing Wetlands", "Mysteries of Earth and Mars" and "Monster Storms" curriculum packets as well as access to the gated-website. Visit [www.jason.org](http://www.jason.org) and/or [www.treca.org](http://www.treca.org) for more information regarding the JASON project components.

*Presented by:* Andy Kazee, JASON in Ohio

Marilyn Zielinski, Toledo Lucas County Public Library

Kathy Kwiatkowski, Case Western Reserve University

*Grade Levels:* 4-9 (E/S S, LS, PS, T)

*Room:* Ballroom 4

**G5****A Day in Space: Linking Content, NASA, and Students**

(Limit 25)

From lift off to landing, an astronaut's day is filled with inquiry, discovery, data collection, and problem solving. Learn how your students can participate in this space simulation that you can set up right in your classroom. Patterned after Challenger Center's "Touching the Future" workshop, the workshop has been updated and developed with today's students and the national content standards at its core. During the session, the attendees will participate in at least 5 of the activities in the simulation so that they are aware of the depth of the simulation. Each attendee will receive a CD containing the complete full-day simulation with 16 hands-on activities designed for students grades K - 4.

*Presented by:* Julie Muffler, Challenger Learning Center of Lucas County

*Grade Levels:* Pk-6 (Ped, E/S S, LS, PS)

*Room:* Owens





## G6

**Helpful, Special (Often Hidden), Features on the TI-83/84 Grapher** (Limit 30)

Even after teaching the TI-Graphing Calculators to mathematics teachers for 10 years at summer workshops, and using the TI almost daily in the HS and University classrooms for 15 years, I still continually find new features that save work and/or time, or allow me to do things that I thought impossible. Typing the SAME THING on different models will sometimes give completely different results or graphs. WHY? How many different ways can we evaluate an expression on the grapher? We will show helpful hints on finding the most useful window when graphing. How can you graph an ellipse? A hyperbola? How can you show the graph and its table on the same screen? Where is the "correlation" key in statistics? Bring your TI-82/83/84.

*Presented by:* Duane Bollenbacher, Bluffton University

*Grade Levels:* 10-12, College (M, T)

*Room:* Parlor A

## G7

**Using Research to Improve Learning in a Junior-level University Mechanics Course: Investigating Student Understanding of Oscillations** (Limit 20)

Ongoing research in physics education has demonstrated that physics majors often do not develop a working knowledge of Newtonian mechanics, even after advanced instruction. This research is guiding the development of Intermediate Mechanics Tutorials, a suite of inquiry-based classroom materials that supplements traditional lectures. These materials Polymers are a class of materials that have infiltrated our lives to the extent that we could not survive without them. They are found in things as diverse as geckos, bandages, and TVs, as well as the cars we drive, the clothes we wear, and the food we eat. Polymers even make up part of our bodies! Participants will learn about free online resources that they can use immediately in their classrooms to meet the Ohio Science Academic Content Standards. are designed to address persistent conceptual difficulties and guide students to make appropriate connections between the physics and mathematics. Workshop participants will learn about recent research results and obtain firsthand experience with selected tutorials on mechanical oscillators. (Project supported by NSF grants DUE-0441426 and DUE-0442388.)

*Presented by:* Bradley Ambrose, Grand Valley State University

*Grade Levels:* College (Ped)

*Room:* Parlor B

## G8

### Where Do We Grow From Here? Lessons on Population and Carrying Capacity

35

(Limit 30)

Engage in interdisciplinary, hands-on activities that examine limits to growth in a finite world. Free activities on CD-ROM!

*Presented by:* Debra Gallagher, Bowling Green State University

*Grade Levels:* 4-9, Pre-service (M, E/S S, LS)

*Room:* Steuben

## G9

### Hmmm....I wonder what will happen if I do THIS?

(Limit 30)

Students CAN go beyond random trial and error in their scientific quests! Try out easy techniques to help students formulate content-driven questions, design & conduct scientific investigations and analyze & interpret their results. Free materials!

*Presented by:* Michelle Shafer, Bowling Green State University, NWO-COSMOS

*Grade Levels:* 7-12 (Ped, PS)

*Room:* Waterford

## G10

### Explore the Science of the Oil and GAS Industry

Participants will engage in 6 learning stations doing hands-on science experiments in geology (porosity, permeability of rocks), physics (design technology), chemistry (properties of oil and water), earth science (Ohio's geological make-up, recycling), and technology (new uses, future products). An energy industry expert will provide an overview about the oil and gas industry in Ohio and information on Ohio geology. Participants also receive instruction on the use of graphic organizers (models, maps, flowcharts, and diagrams), issue-based learning, and career development concepts (developing skills for the real world). Free teaching materials include background information, experiments, career connections and ideas for graphic organizers. Sponsored by OOGEEP (Ohio Oil & Gas Energy Education Program).

*Presented by:* Carol Warkentien, Ohio Oil & Gas Energy Education Project

Jeanne Gogolski, Ohio Oil & Gas Energy Education Project

*Grade Levels:* 4-9, Pre-service (E/S S, PS)

*Room:* Wedgewood

**All Completed Raffle Tickets Must Be Turned In To  
The Check-In Desk by 3:00 pm**





### **Session H (3:00 pm – 5:00 pm)**

#### **H1 Students Show What They Know** (Limit 30)

#### **H1 Students Show What They Know**

Are you looking for ways your students can illustrate their understandings of concepts? Dinah Zike's foldables are graphic organizers in 3-D. Science examples will be given, but foldables can be adapted to any content area. This session will be a make it/take it.

*Presented by:* Janet Struble, The University of Toledo

*Grade Levels:* Pk-12 (Ped)

*Room:* Ballroom 1

#### **H2 Autumn-into-Winter... Seasonal Science Paints an Ohio Learning Perspective** (Limit 30)

#### **H2 Autumn-into-Winter... Seasonal Science Paints an Ohio Learning Perspective**

Enhance your inherent Naturalist Intelligence. Join the Lourdes College Life Lab Personnel for an up-close, senses-alive exploration of plants, animals and people. Get practical inquiry-based, hands-on, minds-on methods for immediate Monday-Morning learning application.

*Presented by:* Linda Penn, Lourdes College Life Lab

Susan Gioiella, Lourdes College Life Lab

Marge Malinowski, Lourdes College Life Lab

*Grade Levels:* Pk-6 (LS)

*Room:* Ballroom 2

#### **H3 Radiation Experiments with a Free Geiger Counter** (Limit 40)

#### **H3 Radiation Experiments with a Free Geiger Counter**

Learn about radiation and receive a free Geiger counter and a CD-ROM with lesson plans, slides, experiments etc. Perform several experiments using your Geiger counter.

*Presented by:* Larry Grime, American Nuclear Society

Dave Briden, American Nuclear Society

Paul Williams, American Nuclear Society

*Grade Levels:* 7-12 (E/S S, PS, T )

*Room:* Ballroom 3

#### **H4 Natural Inquirer: Inquiring into Technology, Reading Comprehension, and Environmental Science**

Have you ever wondered about how to integrate technology, reading comprehension, and environmental science? During this workshop you will learn how to use the Natural Inquirer journal to help integrate technology and reading comprehension skills into your classroom. The Natural Inquirer is a free, environmental science journal that is specifically written for a middle and high school age audience. The journal is based on peer-reviewed, contemporary Forest Service research. The techniques and student work that will be shared with you are from a middle school teacher and his middle school students. Come join us and receive free copies of the journal, class handouts and other resources!

*Presented by:* Safiya Samman, USDA Forest Service

*Grade Levels:* 7-9 (E/S S, O, T )

*Room:* Ballroom 4

## H5 Rocking Through the Ages—Where You Can Find Rocks, Minerals, and Fossils in Northwest Ohio and Southeast Michigan

(Limit 24)

Northwest Ohio and Southeast Michigan is underlain with Paleozoic age sedimentary rocks containing quite a diverse assemblage of minerals and fossils. Fossil Park near Sylvania provides a safe field trip site for your students and a great place for you to build a Devonian fossil collection. Abandoned quarries on Kelleys Island also are places to collect Devonian fossils. Silurian fossils come from quarry dumps at many sites east of Toledo, along with the minerals—celestite, calcite, fluorite, pyrite, and sphalerite. Glacial sediments exposed along stream banks and abandoned sand and gravel pits provide examples of most igneous and metamorphic rocks. The shore of Lake Erie also provides a good selection of rocks. Armed with a geologic map and knowledge of Midwest geology will allow a teacher and/or students to collect a representative samples of most geologic materials in the K-12 curriculum with little travel from your school.

*Presented by:* Mark Camp, The University of Toledo

*Grade Levels:* Pk-12 (E/S S)

*Room:* Owens

## H6 The Physics of Cell Phones and Wireless Communications

(Limit 24)

Students use cell phones every day. Every modern cell phone has more memory and more computing power than the astronauts took with them to the moon and over 195 million Americans use cell phones, but hardly any of them have a clue about how they work. Over the past two years a curriculum has been developed to engage and inspire the next generation of scientists and engineers. In this session we will present the background of this innovative program and then participants will have the opportunity to work with some of the materials designed for the unit. A Two-day workshop for teachers wishing to implement the program is being planned for summer 2007.

*Presented by:* Dave Simmons, St. John's Jesuit High School

Scott Zura, St. John's Jesuit High School

*Grade Levels:* 7-12 (PS, T)

*Room:* Parlor A

## H7 Thinking Like a Scientist: An Inquiry Classroom Model

(Limit 24)

Let COSI Toledo introduce you to our Inquiry Institute and ISIS programs designed to help students and teachers grow together as scientific inquirers in the K-6 classroom. This session will feature a hands-on inquiry science investigation and provide help building process skills, integrating science across the curriculum and designing inquiry assessment strategies.

*Presented by:* Michelle Leow Klinger, COSI Toledo

*Grade Levels:* Pk-6 (E/S S, LS, PS)

*Room:* Parlor B





## H8

### Technology Enhanced Elementary and Middle School Science (TEEMSS) (Limit 28)

TEEMSS has produced 15 units keyed to the National Science Education Standards that take full advantage of computers, sensors, and interactive models across all platforms. Grade levels 3 - 4, 5 - 6, and 7 - 8 have five units each, targeting the five NSES standards: targeting Inquiry, Physical Science, Life Science, Earth and Space Science, and Technology and Design strands. Each unit contains two Investigations, each with a discovery question, several trials, analysis, and further investigations. There is also a teacher's version of each investigation, which contains background material and a discussion guide. The TEEMSS activities are embedded in software (SensorPortfolio) that allows students to read the investigation, answer questions, collect data, analyze their results, and save their work within one application. SensorPortfolio is not specific to any sensor manufacturer or platform. It is designed to work with whatever curriculum, computers, handhelds, and sensors schools may adopt. The workshop will allow you to try out some of the units and see how they would fit in your own classroom.

*Presented by:* Carolyn Staudt, The Concord Consortium

*Grade Levels:* Pk-9 (E/S S, LS, PS, T)

*Room:* Steuben

## H9

### High Priced Scientific Equipment Created Cool & Cheap

(Limit 30)

Teacher / Student devices generated by the teacher or class to visually demonstrate: why we need to revise and design in the world, trace electrical current, what happens to matter on a molecular level constantly that can not see with our own eyes, watch what happens when thermal energy is added to matter, increase thermal energy (heat), and/or what happens when pressure is added to matter.

*Presented by:* Stephen Lease, Frank Elementary School

*Grade Levels:* 4-6 (PS)

*Room:* Waterford

39

## H10 Project EXCITE's Problem-Based Learning Odysseys: A Voyage Worth Taking!

(Limit 30)

During this hands-on, minds-on workshop, we will immerse participants in a mini problem-based learning experience entitled, ZoOdyssey. We will walk through our four learning opportunities: Meet the Problem (understanding the issue), Investigate and Inquire (using diverse investigative strategies for research and problem solving), Build Solutions (brainstorming and critiquing possible options), and Take Action (exploring student service learning opportunities). EXCITE staff will explain the Design Templates used by classroom teachers to develop the current EXCITE Odyssey units. Participants will leave with a better understanding of how they can use our templates to develop their own local PBL, EHS unit. All participants will receive a complimentary, electronic copy of ZoOdyssey and our unique Odyssey design materials.

*Presented by:* Bethany Ash, Bowling Green State University  
Alison Ross, Bowling Green State University

*Grade Levels:* 4-9 (O)

*Room:* Wedgewood

**Pick up Raffle Prizes Between 5:00 pm - 5:30 pm  
at the Check-in Area**





# Presenters

## Keynote Speaker

**Dr. David Carlson**, International Polar Year  
Program Director, Cambridge, England

## Session Presenters

**Bradley Ambrose**, Grand Valley State University  
**Bethany Ash**, Bowling Green State University  
**Jenny Baesman**, Kent State University  
**Terri Benko**, OhioView Consortium –  
The University of Toledo  
**Debra Bercher**, Lourdes College  
**Duane Bollenbacher**, Bluffton University  
**Daniel Brahier**, Bowling Green State University  
**Su Breymaier**, TPS Lincoln Academy for Boys  
**Dave Briden**, American Nuclear Society  
**Vernon Brown**, The University of Toledo  
**Anne Bullerjahn**, Owens Community College  
**Linda Calcamuggio**, Toledo Zoo  
**Mark Camp**, The University of Toledo  
**Dennis Clement**, Ohio Environmental  
Protection Agency  
**Kimberly Cortez**, Arlington Local School,  
COSMOS  
**Robb Cupp**, Leipsic High School  
**Kevin Czajkowski**, OhioView Consortium –  
The University of Toledo  
**Donald Czarcinski**, Lourdes College  
**Mary Czech**, Lourdes College  
**Charlene Czerniak**, The University of Toledo  
**Sally DeRoo**, Carolina Biological Supply Company  
**Janet Emerine**, Bowling Green State University  
**Mary Faw**, Bowling Green State University, PRISM

**Robin Ford Parker**, Lourdes College

**Debra Gallagher**, Bowling Green State University

**Debby Geyer**, The Toledo Blade

**Susan Gioiella**, Lourdes College

**Jeanne Gogloski**, Ohio Oil & Gal Energy  
Education Project, Ohio Soy Bean Council

**Anjali Gray**, Lourdes College

**Larry Grime**, American Nuclear Society

**Greg Hartzler**, Wapakoneta Schools, COSMOS

**Mikell Lynne Hedley**, The University of Toledo

**Raymond Heitger**, Bowling Green State University

**Carin Helfer**, Akron Global Polymer Academy

**Paul Hewitt**, The University of Toledo

**Cathy Holmes**, Ohio Department of Education

**Don Howlett**, USDA Forest Service

**Louise Hoffmann**, IPY International Education  
Outreach Steering Committee

**Cherie Hunter**, Monroe County Intermediate  
School District

**Marcia Kaplan**, Whale of a Tale

**Andy Kazee**, JASON in Ohio

**Edith Preciosa Klingberg**, The University  
of Toledo

**Robyne Kramp**, Bowling Green State University,  
PRISM

**Pam Krompak**, Owens Community College

**Kathy Kwiatkowski**, Case Western Reserve  
University

**Philip Lacey**, East Liverpool High School,  
American Meteorological Society

**Judy Lambert**, The University of Toledo

**Adam Lark**, Bowling Green State University,  
PRISM

## Presenters cont.

**Brenda Leady**, The University of Toledo  
**Stephen Lease**, Frank Elementary School  
**Michelle Leow Klinger**, COSI of Toledo  
**Mary Lightbody**, Otterbein College, NSTA  
**Marge Malinowski**, Lourdes College  
**Lyndsey Manzo**, The Ohio State University  
 Stone Lab Fellow  
**Marge Marcy**, NASA Glenn Research Center  
**Elizabeth McCullough**, Olentangy Liberty  
 High School  
**Karen Menard**, Toledo Metroparks  
**Andrea Milner**, The University of Toledo  
**Justin Molenaur**, Akron Global Polymer Academy  
**Barbara Moses**, Bowling Green State University  
**Julie Muffler**, Challenger Learning Center of  
 Lucas County  
**Mandy Munro-Stasiuk**, OhioView Consortium –  
 Kent State University  
**Jackie Must**, The University of Toledo  
**Courtney Nagel**, Penn State University  
**Julie Nurnberger-Haag**, Bowling Green State  
 University, COSMOS  
**Charles Parson**, Akron Global Polymer Academy  
**Linda Penn**, Lourdes College  
**Christie Pinney**, Fairview High School  
**Donald Pribor**, The University of Toledo  
**Cary Roehm**, Arlington Local School  
**Joanne Roehrs**, Owens Community College  
**Alison Ross**, Bowling Green State University  
**Carolyn Rozko**, Toledo Art Museum  
**Safiya Samman**, USDA Forest Service  
**Eileen Sawyer**, Bowling Green State University  
**Rebecca Schneider**, The University of Toledo

**Nancy Scott**, Bowling Green State University,  
 PRISM  
**Michelle Shafer**, Bowling Green State University,  
 NWO-COSMOS  
**George Shirk**, The University of Toledo  
**Terry Shiverdecker**, Ohio Resource Center for  
 Mathematics, Science and Reading  
**David Simmons**, St. John's Jesuit High School  
**Brenda Snyder**, The University of Toledo  
**Alison Spongberg**, The University of Toledo  
**Carolyn Staudt**, The Concord Consortium  
**Jean Stoner**, TRECA Digital Academy  
**Janet Struble**, The University of Toledo  
**Mari Tate**, Bowling Green State University, PRISM  
**Crystal Taylor**, Toledo Botanical Garden  
**Mark Templin**, The University of Toledo  
**Sue Tenney**, Ohio Energy Project  
**William Thomas**, The University of Toledo  
**Diane Thurber**, Toledo Botanical Garden  
**Stephen Van Hook**, Bowling Green State  
 University  
**Ryan Vigus**, Bowling Green State University  
**D. Michael Waggoner**, The University of Toledo  
**Carol Warkentien**, Ohio Oil & Gas Energy  
 Education Project, Ohio Soy Bean Council  
**Craig Warren**, Lourdes College  
**Paul Williams**, American Nuclear Society  
**Elizabeth Wise**, Lourdes College  
**Sarah Woodruff**, Ohio Department of Education  
**Marilyn Zielinski**, Toledo Lucas County  
 Public Library  
**Jim Zubricky**, Owens Community College,  
 The University of Toledo  
**Scott Zura**, St. John's Jesuit High School





## Vendors

### Akron Global Polymer Academy

The University of Akron  
Akron, OH 44325-0301  
330-972-6104  
*Cairin A. Heifer*  
chelfer@uakron.edu  
<http://agpa.uakron.edu>

### American Chemical Society, Toledo Chapter

210 University Blvd.  
Toledo, OH 43614  
*Edith Klingberg*  
edith.klingberg@utoledo.edu  
<http://www.acs.org>

### Carolina Biological

125 Cinderford Dr.  
Oswego, IL 60543  
*Tom Pence*  
Tom.pence@carolina.com  
<http://www.carolina.com>

### Challenger Learner Center of Lucas County

4955 Seaman Road  
Oregon, OH 43616  
*Julie Muffler*  
Lcesc\_jmr@nwoca.org  
<http://challengeric.org>

### COSI Toledo

1 Discovery Way  
Toledo, OH 43604  
*Michelle Leow Klinger*  
klinger@cositoledo.org  
<http://www.cositoledo.org>

### JASON Expedition in Ohio (TRECA)

2222 Marion Mt. Gilead Rd.  
Marion, OH 43302  
*Andy Kazee*  
andy\_k@treca.org  
<http://www.treca.org/jason/>

### Metroparks of the Toledo Area

5100 W. Central  
Toledo, Ohio 43615  
*Karen Menard*  
karen.menard@metroparkstoledocom  
<http://www.metroparkstoledo.com>

### Northwest Ohio Center of Excellence in Science and Mathematics Education

214 Math Sciience Building  
Bowling Green, OH 43403  
*Michelle Shafer*  
mshafer@bgsu.edu  
<http://www.cosmos.bgsu.edu/NWO>

### National Science Teachers Association

4948 E. Walnut Street  
Westerville, OH 43081  
*Mary Lightbody*  
lightbody.1@osu.edu  
<http://www.nsta.org>

### Ohio Earth Science Teachers Association

6800 Wolff Road  
Medina, OH 44256  
*Ron Fabick*  
rfabick@zoominternet.net  
<http://www.wro.org/ano/educate.htm>

### Ohio Environmental Protection Agency Office of Environmental Education

122 South Front Street  
Columbus, OH 43215  
*Dennis Clement*  
dennis.clement@epa.state.oh.us  
<http://www.epa.state.oh.us/pic/education.html>

### Ohio Junior Science and Humanities Symposium

The University of Toledo,  
2801 W. Bancroft  
Toledo, OH 43606  
*Iris Szelagowski*  
iszela@adelphia.net  
<http://www.biosciences.utoledo.edu/Outreach.html>

### Ohio Oil & Gas Energy Education Program

P.O. Box 187  
1718 Columbus Road, SW  
Granville, OH 43023  
*Rhonda Reda*  
rreda@ooga.org  
<http://www.oogEEP.org>

## Vendors cont.

**Ohio Resource Center for Mathematics, Science and Reading**  
1929 Kenny Rd.  
Columbus, OH 43210  
[t.shiverdecker@ohiorc.org](mailto:t.shiverdecker@ohiorc.org)  
<http://ohiorc.org/>

**OhioView SATELLITES**  
The University of Toledo,  
MS 932  
2801 W. Bancroft St.  
Toledo, OH 43606  
*Kevin Czajkowski*  
[kevin.czajkowski@utoledo.edu](mailto:kevin.czajkowski@utoledo.edu)  
<http://ksuvirtual2.geog.kent.edu/satellites/header.htm>

**Science Education Council of Ohio**  
P.O. Box 349  
Sharon Center, OH 44274  
*William Humphrey*  
[botanyman@tusco.net](mailto:botanyman@tusco.net)  
<http://www.secoonline.org/>

**Stone Laboratory, The Ohio State University**  
1314 Kinnear Rd.  
Columbus, OH 43212  
*Eugene Braig*  
[Braig.1@osu.edu](mailto:Braig.1@osu.edu)  
*Bonita Cordi*  
[Cordi.2@osu.edu](mailto:Cordi.2@osu.edu)  
<http://stonelab.osu.edu/>

**The Reading Railroad, A Children's Bookshop**  
6600 Sylvania Avenue  
Sylvania, OH 43560  
*Mary Kay Culver*  
[trexcpa@aol.com](mailto:trexcpa@aol.com)

**Toledo Botanical Garden**  
5403 Elmer Dr.  
Toledo, OH 43615  
*Crystal Taylor*  
[education@toledogarden.org](mailto:education@toledogarden.org)  
<http://www.toledogarden.org>

**Toledo-Lucas County Public Library**  
325 Michigan Street  
Toledo, OH 43604  
*Karen Wiggins*  
[kwiggins@toledolibrary.org](mailto:kwiggins@toledolibrary.org)  
<http://www.toledolibrary.org>

**Toledo Zoo**  
P.O.Box 140130  
Toledo, OH 43614  
*Linda Calcamuggio*  
[lindacal@toledozoo.org](mailto:lindacal@toledozoo.org)  
<http://www.toledozoo.org>

**WGTE Educational Resource Center**  
1270 S. Detroit Ave.  
Toledo, OH 43614  
*Renee Roth*  
[Renee\\_roth@wgte.org](mailto:Renee_roth@wgte.org)  
<http://www.wgte.org/education>

**Whale of a Tale**  
6734 Worth Ave.  
Sylvania, OH 43560  
*Marcia Kaplan*  
[marciajkaplan@hotmail.com](mailto:marciajkaplan@hotmail.com)

**We wish to thank all our vendors for their donations to our teacher raffle.**





#### American Physical Society

One Physics Ellipse  
College Park, MD 20740-3844  
*Kendra Rand*  
rand@aps.org  
<http://aps.org>

#### Carolina Biological

2700 York Road  
Burlington, NC 27215  
*Melissa Hodges*  
melissa.hodges@carolina.com  
<http://www.carolina.com>

#### Digital Frog International, Inc.

Trillium Place, RR#2  
Puslinch, Ontario,  
Canada N0B 2J0  
*Celia Clark*  
celia@digitalfrog.com  
<http://www.digitalfrog.com>

#### Environmental Systems Research Institute

880 Blue Gentian Road,  
Suite 200  
St. Paul, MN, 55121  
*Charles Fitzpatrick*  
cfitzpatrick@esri.com  
<http://esri.com>

#### Imaginova

470 Park Avenue South,  
9th Floor  
New York, NY 10016  
*Michael Goodman*  
mgoodman@space.com  
<http://www.starrynight.com>

#### Joint Oceanographic Institutions, Inc.

1201 New York Ave, NW,  
Suite 400  
Washington, DC 20005  
*Leslie Peart*  
lpeart@joisscience.org  
<http://www.joilearning.org>

#### K12

8000 Westpark Drive, Suite 500  
McLean, VA 22102  
*Megan Yanagi*  
myangi@K12.com  
<http://www.K12.com>

#### Learning Point Associates

Diehl Road, Suite 200  
Napier, IL 60563  
<http://www.learningpt.org/msc/index.html>

#### NASA Goddard Space Flight Center

Earth Observing System Project  
Science Office  
Code 610,  
Greenbelt, MD 20771  
*Steven Graham*  
Steven.m.graham.2@gsfc.  
nasa.gov  
<http://eospso.gsfc.nasa.gov/index.php>

#### National Arbor Day Foundation

211 N. 12th  
Lincoln, NE 68508  
*Michelle Saulnier-Scribner*  
education@aarborday.org  
<http://www.arborday.org>

#### National Park Service & National Park Foundation

P. O. Box 2587  
Denver, CO 80225  
*Bruce Nash*  
Bruce\_nash@nps.gov  
<http://nps.gov/learn/home.htm>

#### National Space Biomedical Research Institute

One Baylor Place  
Houston, TX 77030  
*Lauren Hammit*  
lhammit@bcm.tmc.edu  
<http://www.ns bri.org/Education/Materials.html>

#### ODNR, Division of Wildlife

2045 Morse Road, Bldg. G-1  
Columbus, OH 43229  
*Jen Dennison*  
jen.dennison@dnr.state.oh.us  
<http://www.dnr.ohio.gov/wildlife>

#### Ohio Environmental Protection Agency

122 South Front Street  
Columbus, OH 43215  
*Dennis Clement*  
Dennis.clement@epa.state.oh.us  
<http://www.epa.state.oh.us/pic/education/html>

#### The Concord Consortium

10 Concord Crossing, Suite 300  
Concord, MA 01742  
*Carolyn Staudt*  
Carolyn@concord.org  
<http://www.concord.org>

## Donations cont.

### The Space Foundation

Coalition for Space  
Exploration Activities  
707 Mullet Road, Suite 201  
Cape Canaveral, FL 32920  
*Jim Banke*  
[jbanke@spacefoundation.org](mailto:jbanke@spacefoundation.org)  
<http://www.spacefoundation.org>

### United States Navy

538 South Reynolds Road  
Toledo, OH 43615  
*Robert L. Ehmann*  
[11816302@cnrc.nav.mil](mailto:11816302@cnrc.nav.mil)  
<http://www.navy.gov>

### USDA Forest Service

320 Green Street  
Athens, Georgia 30602  
*Barbara McDonald*  
[bmcDonald@fs.fed.us](mailto:bmcDonald@fs.fed.us)  
<http://www.naturalinquirer.usda.gov/>

### University Corporation for Atmospheric Research, UCAR

P. O. Box 300  
Boulder, CO 80307  
*Marina La Grange*  
[mlagrange@ucar.edu](mailto:mlagrange@ucar.edu)  
<http://www.windows.ucar.edu>

### Virtual Courseware Project

California State University,  
Los Angles  
5151 State University Drive  
Los Angles, CA 90032  
*Mel Limson*  
[mlimson@calstatela.edu](mailto:mlimson@calstatela.edu)  
<http://ScienceCourseware.org>

### William K. Sheridan & Associates

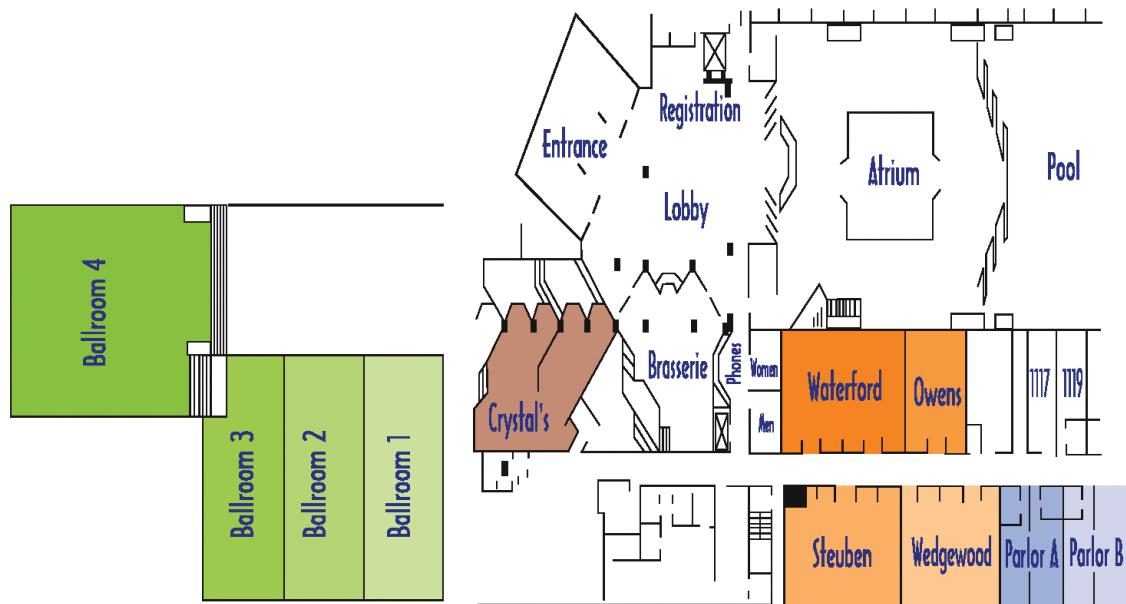
8311 Green Meadows  
Drive North  
Lewis Center, OH 43035  
*William K. Sheridan*  
[info@classroomgoodies.com](mailto:info@classroomgoodies.com)  
<http://www.classroomgoodies.com>

**We wish to thank all our donors for their  
contributions to the success of our Symposium.**





## Clarion hotel floor plan



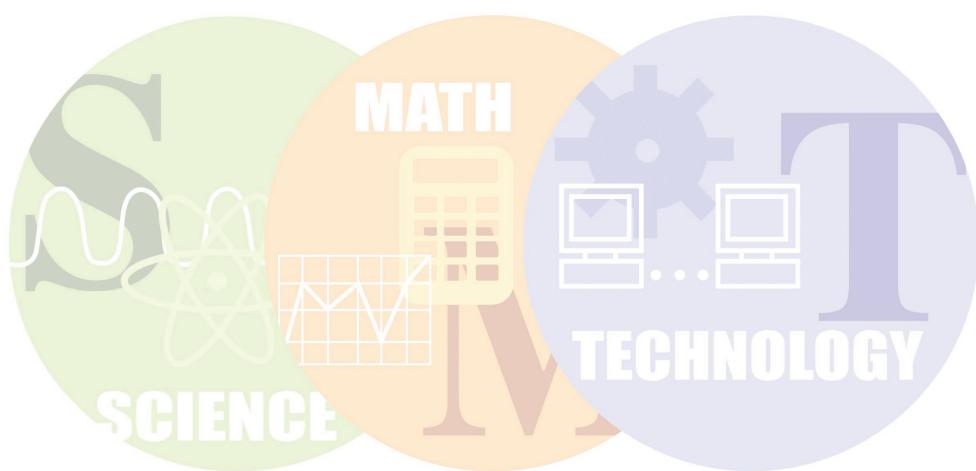


We wish to acknowledge the following individuals who worked so hard to make this Symposium a success:

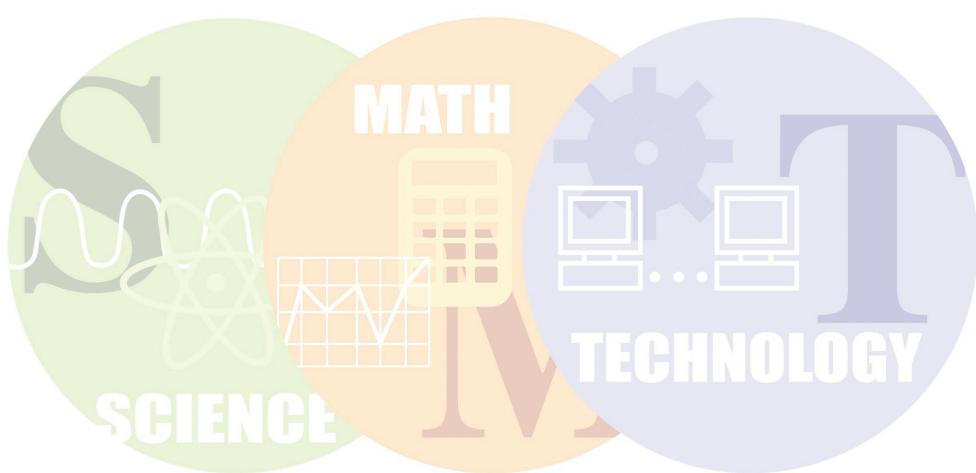
*Symposium Planning Committee*

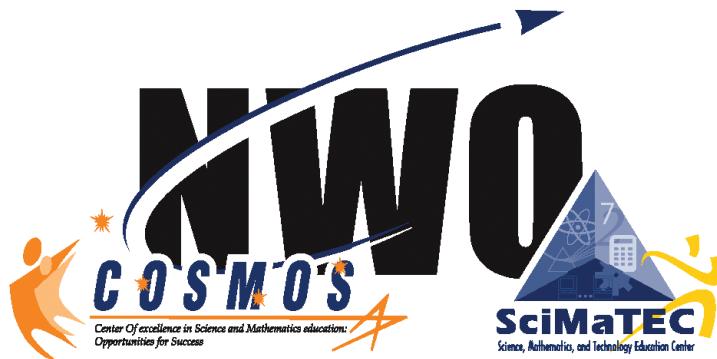
<b>Bowling Green University:</b>	Jodi Haney Julie Nurnberger-Haag Michelle Shafer Stephan Van Hook
<b>GTCTM:</b>	Debra Shelt
<b>Lourdes College:</b>	Don Czarcinski William Lindeman Cynthia Molitor Elizabeth Wise
<b>The University of Toledo:</b>	Robin Brown Emilio Duran Mikell Lynne Hedley Leslie Smith Janet Struble William Thomas
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48





## ***Northwest Ohio Center of Excellence in Science and Mathematics Education***

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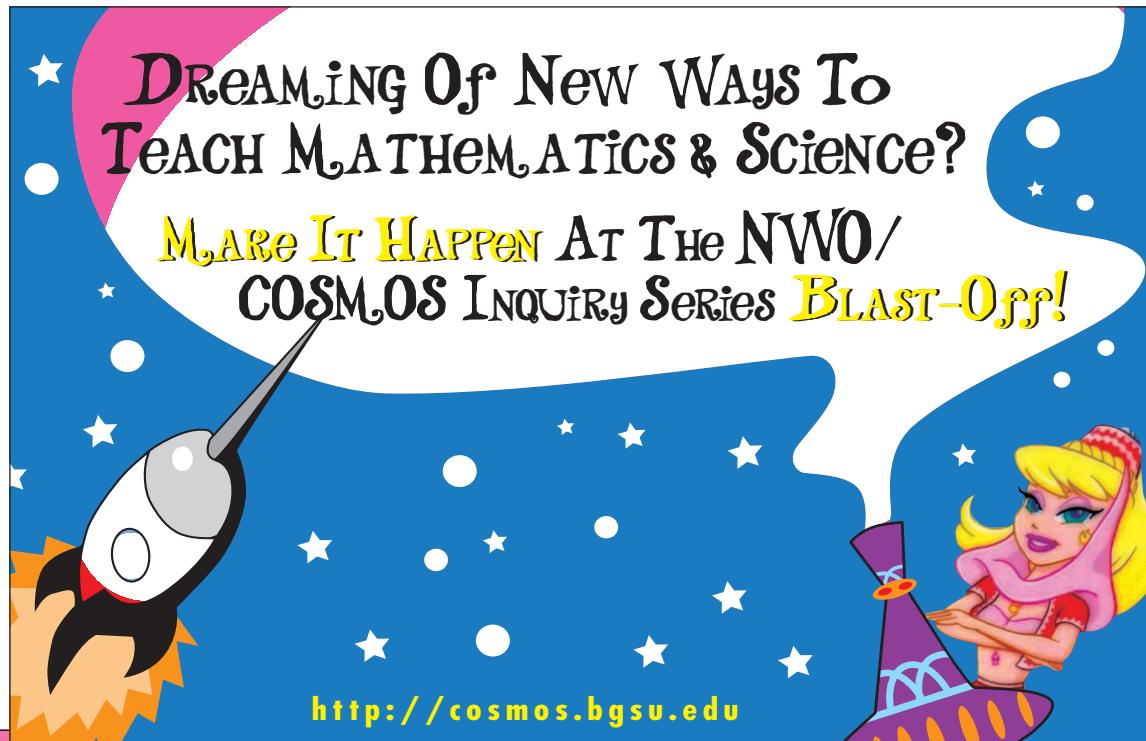


The 2006 NW Ohio Symposium on Science, Math and Technology Teaching is being sponsored by the Northwest Ohio Center of Excellence and its partners SciMaTEC, COSMOS, Owens Community College, and PRISM



# APPENDIX C

## COSMOS Inquiry Series Recruiting Postcard



Inquiry Series 2006-07:  
**INVESTIGATIVE  
MATHEMATICS & SCIENCE**

*Investigative Mathematics and Science Feature Presentations*

**Blast-Off, Sept 16:** Keynote Speaker: Dr. Larry Lowery, Lawrence Hall of Science; Pick break out sessions just right for you! Math Science Bldg., BGSU; 8:30 am – 12:30 pm  
 \* Oct 5: Investigating via Activities: Games, Manipulatives, Simulations, and Visualizations; 5 – 8 pm  
 \* Nov 3 & 4: NWO Symposium on Science, Math and Technology Teaching  
 \* Dec 7: Investigating Hands-on, Minds-on Learning; 5 – 8 pm  
 \* Jan 18: Investigating via Technology Tools; 5 – 8 pm  
 \* Feb 22: Using assessment to guide investigations; 5 – 8 pm  
 \* Mar 15: Investigating via Problem Based Learning and Real-World Approaches; 5 – 8 pm

**Summit, Apr 28:** 8:30 am – 12:30 pm

**Oct 5, Dec 7, Jan 18, Feb 22, and Mar 15** will be held at Owens Community College, Audio-Visual Classroom Center, main room #125.

\* In place of these presentations, you can meet with other teachers to conduct action research or develop and implement a classroom inquiry action plan. NWO TEAMS teachers attend content sessions.



CEUs available or 2 paid graduation credit hours [30 scholarships available]!

Register online TODAY at: <http://cosmos.bgsu.edu>



*Northwest Ohio Center of Excellence  
in Science and Mathematics Education*

Jodi Haney, Ph.D., Director  
241 Math Science Bldg., BGSU  
Bowling Green, OH 43403-0212  
(419) 372-2718



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*COSMOS is a partner of the Northwest Ohio Center of Excellence in Science and Mathematics Education (NWO).*

*Funding provided by the Ohio Board of Regents and the Ohio Resource Center.*

# APPENDIX D

## Course Redesign/Development Syllabi and Supporting Documents

### Introduction to Secondary Mathematics

**EDTL 490**

**Fall 2006 (1:00 – 2:15, Tues/Thurs)**

<b>Instructors:</b>	Daniel J. Brahier (and Barbara Moses)
<b>Office:</b>	124 Life Science Building (enter through the LSC 126 door)
<b>E-Mail:</b>	brahier@bgsu.edu (or bmoses@bgsu.edu)
<b>WWW:</b>	<a href="http://bgmath.org">http://bgmath.org</a> (from the “Instructors” button, select “Daniel Brahier”)
<b>Phone:</b>	(Office) 419.372.0339 (or 2-7464) (Home) 419.874.2836 (emergencies only, please)
<b>FAX:</b>	(located in 126 Life Science Building) 419.372.7291
<b>Office Hours:</b>	Tuesday: 2:15 – 3:15 p.m. Wednesday: 9:00 – 11:00 a.m. Thursday: 9:00 – 10:00 a.m. Other Times by Appointment
<b>Textbook: (required)</b>	<i>Navigating Through Mathematical Connections in Grades 9-12, NCTM, 2005 (\$35) Ohio Academic Content Standards, Ohio Department of Education, 2001</i>

### COURSE DESCRIPTION

EDTL 490 (MATH 280). Introduction to Secondary Mathematics. Review of content typically taught in the high school curriculum, including trigonometry, topics from geometry, discrete mathematics, and algebraic concepts. An introduction to state and national Standards in mathematics, including the use of hands on materials and current instructional technology.

### PREREQUISITES

“C” or better in MATH 131 and sophomore status.

### COURSE OBJECTIVES

The student will:

- Relearn and deepen understanding of key high school mathematics topics.
- Identify emerging mathematics topics and their role in the secondary curriculum.
- Explain how the use of hands-on materials and inquiry approaches to teaching enhance the mathematics classroom.
- Demonstrate proficient use of current instructional technology used in the teaching of mathematics.
- Describe the vision of mathematics content and teaching as exhibited in the state and national standards for the teaching and learning of mathematics.

## OVERVIEW OF TOPICS TO BE COVERED

1. "Big" ideas of Algebra (content typically taught in Algebra I and Algebra II)
2. High School Geometry, including ...
  - a. Proof formats (two-column versus paragraph)
  - b. Key theorems/postulates
  - c. Area/volume formulas
  - d. Constructions – compass/straightedge and Geometer's Sketchpad
3. Discrete Mathematics, including ...
  - a. Basic Probability
  - b. Combinations and Permutations
  - c. Networks
  - d. Recursion
  - e. Voting methods/Fair Division
4. Pre-calculus Topics, including ...
  - a. Trigonometry (including graphs of functions and identities)
  - b. Functions
  - c. Limits

### *THEMES THREADED THROUGHOUT THE COURSE*

1. Integrated versus traditional curricular sequencing
2. Authentic assessments
3. National and state standards in mathematics
4. Textbooks available to secondary teachers
5. Preparation for Praxis II AYA mathematics exam
6. Emerging technologies, such as:
  - o Geometer's Sketchpad
  - o Fathom
  - o Graphing calculator (TI-84 versus Voyage, etc.)
  - o Downloading/Using TI products from the Web
  - o Excel spreadsheets
  - o CBL/CBR for data collection
  - o MathType software
  - o Smart Board

### ***Ongoing Assessments***

ATTENDANCE/PROFESSIONALISM/PARTICIPATION (30 points) - It is assumed that each student will exhibit a positive and professional attitude, attend every class, be on time, have completed required reading assignments, and **actively contribute in a positive and professional manner** in classroom discussions. Each unexcused absence or three tardies will result in a minimum 10-point deduction. If you are ill or an emergency arises, it is your responsibility to call or email the instructor before class. At the end of the course, each student will receive a numerical score in this area. Treat this class as a teaching job where you are expected to be here and to be on time for every session.

HOMEWORK PROBLEMS (30 points) – Mathematics problems will be assigned, from time to time, in class to be attempted and completed for a subsequent class. It is expected that each student will solve these problems to the best of his/her ability. Problem solutions will be collected and graded as an assessment of mathematical understanding.

**ELECTRONIC JOURNAL** (20 points) - Each student will write and post to the class Discussion Board a total of five journal entries (@ 4 points each), reflecting on issues raised in this course. One entry will be due about once every two or three weeks, and prompts will be given at the Blackboard site. The purpose of this assignment is to promote reflection on the teaching and learning of secondary mathematics topics.

**PROFESSIONAL DEVELOPMENT** (10 points) - Learning to be a mathematics teacher cannot be accomplished within one semester; it is an ongoing, lifelong endeavor. Throughout the semester, each student is expected to demonstrate evidence of willingness to become a lifelong learner. Several opportunities are available, including (but not limited to): (1) joining the BGCTM and attending a Fall meeting [8 points guaranteed], (2) attending the OCTM conference in Toledo on 12-14 October, (3) joining the NCTM through a regular student membership, (4) observing mathematics teachers outside of the required assignment (such as Dr. Brahier's 8th Grade class at St. Rose), (5) reading a book or series of articles on mathematics education other than those required for class, (6) conducting Web searches of teaching resources and compiling a bibliography, (7) attending a campus technology training session, and so on. At the end of the term, each student will assess himself/herself in his/her Professional Development and provide evidence justifying a final score.

### ***Performance Tasks***

**TEXTBOOK COMPARISON** (25 points) – Each student will be given two textbooks at the same grade level – one that is commercially published and one that is National Science Foundation funded – and will review and compare the contents of the books in a written paper. Specifically, the purpose of the assignment is for students to critically analyze the mathematics content of two commonly used books and to determine advantages and possible drawbacks to using one book versus the other.

**TECHNOLOGY LESSON** (20 points) – Each pair of students will explore the use of one commonly used software and/or hardware in the teaching of mathematics and will demonstrate its use to the rest of the class in a 12-minute presentation. It is expected that the others in the class will actively use the technology (as opposed to the presentation being a lecture on how to use the product). Examples of technology to demonstrate include lesson ideas using Geometer's Sketchpad on a computer, Cabri Geometry on a graphing calculator, Fathom, Downloading/Using TI software from the Web, Excel spreadsheets, CBR/CBL for data collection, MathType software, SmartBoard, a menu (such as MATH, NUM, CPX, PRB, etc.) on a graphing calculator, etc.

**MATERIALS DEMONSTRATION** (25 points) - Each student will become proficient with a selected manipulative material (algebra tiles, geoboards, Cuisenaire rods, or base ten blocks) and will demonstrate (10) the use and benefits of the material to a small group of students. A written report (15) on the use of the material must be prepared for each group member. The report should be a document which includes: (a) a thorough description of what the manipulative is, (b) an extensive list of the mathematical concepts that can be demonstrated by using the manipulative in grades 7-12 [a discussion is not needed, just a listing], and (c) three activities which demonstrate the diversity and creativity of its use in grades 7-12 (three different referenced sources are required – one activity (but no more than one) *must* come from the Internet; the other two ideas must come from some other “paper” source, such as a journal or resource book). These three activities should illustrate the diversity of content and grade level material that can be promoted through use of the manipulative. The report should both include appropriate handouts to support the activities. The purpose of the assignment is to judge the student's ability to examine commercial resources and familiarize others with their purpose and classroom use. Resources with teaching ideas are books located in the Curriculum Library (2nd Floor, Jerome Library) and PRISM, journals in the Mathematics/Science Library and PRISM, and the Internet.

**WEB SITE CRITIQUE** (20 points) - Each student will select one Web site that appears to offer a rich opportunity for students to learn significant mathematics through use of the site. A written paper will be submitted which includes the following: (a) a general description of the Web site (including its address and title) and what it features [5 points], (b) a critique of the Web site itself (is it useful to teachers? easy to navigate? etc.) [5 points], (c) a discussion of the mathematics that can be learned from students and/or teachers using this site [10 points]. Web sites and reactions will be shared in class on the due date.

## **Unit Tests/Papers**

TEST/PAPER (4 @ 50 points each = 100 points) – The Algebra and Geometry units will conclude with a written exam, while Discrete Mathematics and Precalculus units will conclude with the submission of a required paper (topic and contents to be announced).

### *Final Exam*

FINAL EXAM (25 points) – Each student will take an exam that is similar in content and design to the Praxis II exam during Finals Week. The test will include multiple-choice items that are drawn from the four content areas of secondary mathematics explored in this course. After completing the exam, the class will also take some time to discuss its contents and solutions.

## **Field Experience Component**

FIELD EXPERIENCE QUESTIONNAIRE (25 points) – It is important the each student get exposure to the range of middle childhood classrooms, from grade 7 through grade 12. Each person is responsible for obtaining a minimum of 3-4 hours of field experience over the semester. Half of the time (about 2 hours) is to be spent in a setting of grades 7-9, and the other half of the time (about 2 more hours) must be spent in grades 10-12. Details on how and when to observe in schools will be discussed in class. It is best to visit a school of your choice, such as a school in your “hometown” during spring break, etc. Additional possible field sites will be provided. On the due date, a questionnaire about your observations is to be submitted, which includes spaces for signatures of teachers and times when you conducted your visits.

## **COURSE GRADES**

The purpose of this course, as is all education, is to learn – not just to “work for a grade.” While all students should be capable of earning an A in the course, merely completely the work does not constitute A work. Instead, the final determination of a course grade relies primarily on the **quality** of work presented for the various assignments. You work will be assessed based on criteria established in our course. Please note that to receive credit, all written work **must** be submitted on time. Although not “set in stone” (natural breaks will be used to determine final cutoff scores), it is expected that final grades will be determined as follows:

Total Points Possible = 330					
330 – 300	A	269 – 240	C	209 or less	F
299 – 270	B	239 – 210	D		

\*\* NOTE: Any student who does not complete (i.e., for some reason takes a “0” on) even one assignment (such as a Discussion Board Post) during the term will not be able to earn an “A” for the course, even if that individual accumulates the required total of points. An “A” student is not only a person who earns enough points but is one who shows consistent effort throughout the term.

## **OTHER IMPORTANT INFORMATION**

### **ATTENDANCE POLICY**

As noted above, attendance, participation, and punctuality are reflections of one's commitment to professionalism. Therefore, attendance in class is expected and required. If legitimate circumstances warrant your absence, notify the instructor prior to class meetings via voice mail or e-mail. Should a situation occur such as a sudden illness, accident, or other emergency, please send e-mail or leave a voice mail message as soon as possible. In the event of these rare circumstances, an evaluation will be made on a case-by-case basis based upon promptness of notification, explanation, and circumstance.

Prolonged absences and unexpected events/illnesses must be accompanied by appropriate documentation in order to make up assignments missed. No provisions will be made for “making up” assignments missed or not turned in due to an unexcused absence or tardiness.

If you are absent (and it is an excused absence), you should get the notes and handouts from a classmate. Once you have collected the materials and class notes, you are welcome to see me for assistance during my office hours. If any assignments are due on the date of your excused absence, if possible send them in with a classmate or make prior arrangements with the instructor.

#### EXPECTATIONS

Major assignments have been included on the syllabus. Please note: **ASSIGNMENTS ARE DUE ON TIME AND AT THE BEGINNING OF CLASS. NO LATE PAPERS WILL BE ACCEPTED FOR CREDIT.** However, should deadlines be obstructed by extenuating circumstances that occur, and having informed such with the instructor (via e-mail 24 hours prior to the due date), deadlines may be extended until the next class meeting. In the event of a circumstance such as a sudden illness, accident, or other emergency, please send an e-mail or leave a voice mail message as soon as possible and an evaluation will be made on a case-by-case basis based upon promptness of notification, explanation, and circumstance. Waiting until the last minute to go to the computer lab and print out an assignment, running out of printer paper, needing a new ink cartridge, my computer crashed, my disk won't open, I left my assignment in another folder/at home/in my car, etc., are not extenuating circumstances. Therefore, it is important to organize and manage your time wisely.

**Check each specific rubric and the syllabus for the expectations of each assignment. Papers submitted without the appropriate criteria (as specified by the rubric/syllabus) will result in a loss of points.**

Assignments will be returned on a timely basis; however, **POINTS ARE NON-NEGOTIABLE ITEMS UNLESS THERE IS A MATHEMATICAL ERROR.**

Check your BGSU e-mail account and Blackboard regularly as these are the most efficient way to communicate any changes or any additional information that may be necessary and pertinent to the class. Save and keep copies of e-mails sent regarding absences/assignments. I will email you should class need to be cancelled due to any extenuating circumstances.

#### ACADEMIC HONESTY

All exercises and papers completed in this course are to be the work of the individual student. Cheating, plagiarism, or facilitating the academic dishonesty of another student are all violations of university policy and professional conduct. In accordance with the academic honesty policy of the University, all instances of dishonesty will be acted upon and reported by the instructor. Please refer to the Student Affairs Handbook for a detailed explanation of these violations and their consequences.

#### CODE OF CONDUCT

Please note that one's attitude, conduct, and deportment are indicators of one's own understanding of professionalism. Therefore, students are expected to display appropriate attitude, demeanor, and deportment. Instances of disruption, disrespect, and inappropriateness will be acted upon and reported by the instructor. Please refer to the Student Affairs Handbook for a detailed explanation of these violations and their consequences. Also, pagers, cell phones, and text messengers, etc. must be turned off during class time.

#### DISABILITY SERVICES FOR STUDENTS – 413 South Hall

The goal of the Disability Services for Students Office is to help provide equal access and reasonable accommodations to BGSU students with disabilities. Students wishing to discuss their eligibility for such accommodations are encouraged to contact the office.

Phone: (419) 372-8495, Fax: (419) 372-8496, TTY: (419) 372-0582

## Supporting Information for Curriculum Modification Request

### 1. Catalog description

MATH 582 Active Chance. Introduction to probability including probability viewpoints, sample spaces, properties of probabilities, counting methods, conditional probability, discrete and continuous distributions, and binomial and normal distributions.

Emphasis on the use of hands-on and technology activities to demonstrate probability concepts. Prerequisite: MATH 245 or MATH 247 or MATH 341 or MATH 441 or consent of instructor.

### 2. Complete description of course

a. The purpose of this course is to provide a “simulation-based” introduction to topics of probability for the current high school (grade 9-12) teacher who may be teaching this material in the schools. The course is designed specifically for the student who is enrolled in the MAT degree in Mathematics. The National Council of Teachers of Mathematics (NCTM) has established standards in teaching math for all students in grades 9-12. As part of the Data Analysis and Probability strand, the standards state that all students in grades 9-12 should understand the concepts of sample space and probability distribution and construct sample spaces and distributions, use simulations to construct empirical probability distributions, compute and interpret the expected value of random variables, understand the concepts of conditional probability and independent events, and understand how to compute the probability of a compound event. The focus of this online course will be on learning these concepts by the use of technology and hands-on simulation experiments. These simulation experiments will provide models for the teachers in their own instruction at the high-school level.

### b. Student learning outcomes

The student at the completion of this course should be able to

- Correctly identify a probability as a classical, frequency, or subjective type.
- Write down the sample space and assign probabilities for simple random experiments.
- Construct a probability simulation, either of the hands-on or the technology type, of a random experiment and use the simulation results to compute probabilities of interest.
- Construct probability distributions of discrete random variables by the use of simulation experiments.
- Be able to summarize a discrete probability distribution by the computation of a mean, a standard deviation, and percentiles.
- Understand the basic properties of binomial and normal random variables.
- Be able to compute conditional probabilities in simple random experiments.

### c. Plan for assessing student-learning outcomes

The material will be taught by a series of activities that involve the use of hands-on and technology activities. In a typical activity, the student is led through a particular probability experiment. She or he is asked questions about the results of the experiment and then is asked to design a similar probability experiment. All of the student learning outcomes will be assessed through the students’ performance on these activities.

### d. Grading procedures

A grade will be assigned on the basis of the student’s performance in completing the hands-on and technology activities. A student who is successful in answering the questions correctly and can correctly design the experiments will receive an A in the class.

e. Topical outline for content to be covered.

The class will be divided into eight modules.

Topic 1: Introduction to the statistics computer package Fathom

Topic 2: Viewpoints of probability and formal probability

Topic 3: Introduction to the use of simulation to compute probabilities

Topic 4: Conditional Probability

Topic 5: Probability distributions

Topic 6: Coin tossing distributions

Topic 7: Continuous distributions

Topic 8: The Normal distribution

f. Instructional strategies.

This course will be taught web-based. Since the focus of the course will be on the application of hands-on and technology simulation experiments, there will be a series of QuickTime movies available on the course web site that demonstrate different aspects of the technology. There will be different methods such as threaded discussion boards to facilitate communication between the instructor and the students.

g. Student learning activities.

The focus of this course is on the use of activities in learning probability.

h. Specimen bibliography.

Albert, J. (2007) *Introduction to Data Analysis and Probability for Teachers*, Key College.

Ross, S. (2001) *A First Course in Probability*, Prentice Hall

## Report of the BAPS workshop at Bowling Green State University on April 22, 2005

Jim Albert

Department of Mathematics and Statistics, BGSU, Bowling Green, OH 43403

[albert@bgnet.bgsu.edu](mailto:albert@bgnet.bgsu.edu)

The purpose of this workshop was to inform the high school teachers of Northwest Ohio about the AP Statistics program and to provide resources for the teachers who are currently teaching this class. A program (listed below) was put together with the help of faculty and instructors who teach in the Department of Mathematics and Statistics and the Department of Applied Statistics and Operations Research. To help advertise the workshop, a mail listing of all high schools in the ten-county area of Northwest Ohio was obtained from COSMOS, a center of mathematics and science education at BGSU. Initially brochures were sent to all principals at the local high schools. This was followed by emails sent to all of the high school principals. In addition, the workshop was advertised at the Department of Mathematics and Statistics. The people on campus that might benefit most from the workshop were the instructors of introductory statistics, and Middle-Childhood and Secondary Education undergraduate majors with interests in mathematics.

Unfortunately, we received only a limited response from the high school teachers. We had five inquiries about the workshop from teachers and three of them were able to make the meeting. In all, the attendance at the workshop ranged between 12- 22 people that included faculty, graduate students, statistics instructors, high school teachers and undergraduate students.

The meeting was held at the Union at BGSU and a lunch immediately followed the meeting.

The program for the workshop went very well. Dr. Herb McGrath opened with an entertaining talk on the misuses and misstatements of statistical information presented in the media. Several of my MATH 245 (Statistics for Middle School Teachers) students attended Dr. McGrath's presentation and their summary comments indicated that they were both entertained and informed about the misuse of statistics in the media. This talk was followed by a panel discussion by three faculty at BGSU who have served as graders for the AP statistics exam. The panelists described the experience of grading this exam, and outlined several areas (such as explaining the results of statistical studies) where the students had problems. I followed with a technology talk. I borrowed TI-84 Plus calculators from the TI calculator loan program, and illustrated John Tukey's idea of straightening a graph using three summary points. The participants got experience plotting and fitting lines and running a short program that helped in finding the right power transformation on the y variable. The program concluded with a presentation by our outside speaker, John Holcomb from Cleveland-State University. Dr. Holcomb described the use of an interesting dataset about domestic violence that he uses in teaching statistics. We used the calculators to compute risk ratios from two-way contingency tables and we discovered which variables distinguished a sample of abused women and a control group.

Although we had limited participation from teachers, I think the workshop went well and everyone benefited from at least one presentation. There were opportunities to talk and I think we now have some connections with the high school teachers.

The budget for the meeting is shown below. The ASA paid for the expenses of the outside speaker John Holcomb. All of the other expenses were paid by the Northwest Ohio Chapter of ASA.

Budget:

Postage	\$30
Speaker Gift	\$12.45
Rooms Charges	\$18.75
Breakfast	\$71
Luncheon	\$139
Brochure printing	\$150
<hr/>	
<b>TOTAL</b>	<b>\$421.50</b>
- fees collected	\$45
<b>TOTAL COST</b>	<b>\$371.50</b>

Advertisement for the workshop

The Northwest Ohio Section of the American Statistical Association  
Presents

Beyond the AP Statistics Workshop  
April 22, 2006

Bowen-Thompson Student Union, Bowling Green State University

SCHEDULE Bowen-Thompson Student Union, BGSU, Room 315

8:30 Welcome and Continental Breakfast

9:00-9:40 Prof. Herb McGrath, BGSU  
“Statistical Gaffs and Guffaws: Some Funny (and Not So Funny) Statistical Mistakes”

9:40-10:20 Panel Discussion by AP Statistics Exam Graders  
(Prof. Jane Chang, Diane Conway, Prof. Arjun Gupta, BGSU)

10:40-11:20 Prof. Jim Albert, BGSU — Technology Session  
“Fitting Lines and Curves by Using 3 Summary Points”

11:20-12:10 Prof. John Holcomb, Cleveland State University  
“Making Statistics Real: Quantifying Health Effects of Domestic Violence”

12:10 Lunch

# APPENDIX E

## COSMOS Publication: Moran & Van Hook (2006)

Using Student Peer Review of Experiment Reports in an Undergraduate Physics Class 11/13/2006 12:43 PM

**NSTA** National Science Teachers Association

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**Journal of College Science Teaching**  
Vol. 36 No. 1, p. 45-49  
September 2006  
Feature

### Using Student Peer Review of Experiment Reports in an Undergraduate Physics Class

**Timothy Moran and Stephen J. Van Hook**

*A class centered on student design of experiments and peer review of the resulting reports is described. Thirteen students in an honors seminar section of an introductory physics class designed experiments to test various types of paranormal phenomena. Each experimental report was evaluated and ranked by several other students. To give them experience in interpreting controversial results, the students were instructed to slant their experimental reports toward either a paranormal interpretation or a non-paranormal interpretation as much as possible within the constraints of the data. Then students evaluated each other's reports using a commentary and ranking form. Survey and interview data obtained after the class indicated an increase in students' confidence in their ability to evaluate media science reports.*

In today's technological world, it is unfortunate that many still do not have a solid understanding of the scientific process. According to the NSF Science Indicators Report (2002), survey and interview data reveal that about 70% of Americans could not properly answer questions about basic scientific reasoning. Many educational methods have been proposed to improve the public understanding of science. For example, Hobson (1996) described how historical examples can illustrate the nature of science, while Welsh (2000) describes how a class assignment involving advertising for magnetic therapy devices can achieve a similar goal. One ambitious study (O'Neill and Polman 2004) involved devoting most of an entire academic year of a high school science class to student-directed research projects. While intriguing, such a large investment is not practical for most high school science classes, or for introductory college-level science classes. Others (Robinson 2001; Trautmann et al. 2003) have described software that enables convenient management of student peer-



[http://www.nsta.org/main/news/stories/college\\_science.php?news\\_story\\_ID=52394&print=yes](http://www.nsta.org/main/news/stories/college_science.php?news_story_ID=52394&print=yes) Page 1 of 8

review assignments in large classes. Here we report on a peer-review activity that emphasizes peer review as an important part of the scientific process.

## Peer-review study

During fall 2004, an honors section of an introductory physics class incorporated student-chosen research projects and peer review. The honors section consisted of 13 students and met once a week for a 50-minute meeting in addition to the main class. The main class was a first-semester introductory calculus-based physics class including a total of 36 students that was taught by a regular faculty member, while the honors seminar was cotaught by the main instructor and a postdoctoral researcher. Students in the seminar class received honors credit, but did not receive a grade separate from the main class. The activities described below required eight of the weekly honors sessions.

In the honors seminar class, the students were assigned to perform several stages of an effective research program. They designed experiments, performed experiments, wrote experiment reports, reviewed reports written by other researchers, and then revised their own reports based on reviews from their peers. Surveys and interviews with the students were performed to determine whether student attitudes had changed during the experience. In previous semesters, this seminar had examined pseudoscience issues, but during this semester the instructors added experimentation and peer review to enhance the contrast between science and pseudoscience.

It was expected that students did not have much experience designing experiments, so several class meetings were spent discussing the features of good and bad experiment designs. As preparation, readings were assigned for homework and videos were shown during class. The readings consisted of chapters from the James "The Amazing" Randi book *Flim Flam!* (1982), along with an article by Rosa et al. and related letters to the editor (1998 and 1999). The story behind the Rosa article is especially interesting since one of the primary investigators is an 11-year-old, which illustrates that people with limited science education can perform useful science if careful and honest. The videos included portions of the "Secrets of the Psychics" episode of the television series NOVA that showed James Randi designing experiments that test the claims of paranormal practitioners (1997). In addition, a scene from the beginning of the movie *Ghostbusters* demonstrated an extremely flawed telepathy experiment. The readings, the videos, and the related class discussions were intended to provide both positive and negative examples of ways to test paranormal claims with only a moderate amount of effort.

After this stage, students were asked to form groups of two or three and submit one-paragraph proposals for interesting experiments that tested paranormal claims. The topics presented by the groups were a comparison of horoscope predictions to daily events of various subjects, a comparison of horoscope predictions with simulated horoscope predictions created by a program using a random number generator, a high-card drawing game where one person is wished to have good luck by an observer, and attempts to predict the suits of playing cards selected at random or the totals of rolled dice. As expected, the proposals were not detailed enough for feasible experiments to begin. After reviewing the difficulty of implementing the proposals, the instructors grouped the students into three teams, placing together students with similar proposals as much as possible. Then, the instructors gave advice to the three groups to make the experiments more practical, but left the final details to the students.

Students were given three weeks to complete the project and submit reports. While each group gathered the data together as a team, students were instructed to analyze the data independently and to write up individual reports. The reports were required to be approximately five pages long and to include the following sections: title, abstract, background, procedure, graphed data, results, and discussion. Typical report titles were "Does Wishing Good Luck Affect Who Picks the Higher Playing Card?" "A Quantitative Analysis of the Accuracy of Astrologically Based Predictions," and "Dice Rolling Using Telepathy and Telekinesis."

One innovative feature of the study was that students were instructed to decide on a position of either pro-paranormal interpretation or anti-paranormal interpretation and to make their report as persuasive as possible within the constraints of the data. Students were instructed to discuss their positions with others in the same group and arrange that both sides were represented in each group. Students were told that effective slanting is difficult since statements that are too extreme or that contradict the data are likely to cause the reader to lose confidence in the article.

This inclusion of bias into the reports was intended to provide good training to students to be perceptive of biased reporting, and to be good science information consumers. Students were able to compare conflicting slanted reports, and to have recent, intimate experience with the topics. Writing persuasive papers is a common assignment in other areas of education, such as in writing classes or history classes. However, since this is not frequently done in science classes, students may not appreciate that science reports can also be written to persuade the reader toward a particular belief. Also, it is likely that evaluating persuasive reports containing numbers and graphs is a very different skill than evaluating text-only reports.

## Student response

Overall the students produced reports that were both persuasive and reasonably descriptive of the data. However, since students collected all the data themselves, the number of trials available for discussion was quite limited. With such a small sample size, patterns that supported paranormal interpretations could be found. As a result, none of the reports had a level of bias so great that a reasonable reader would consider it to have no credibility. Below are examples of slanted statements from the initial experiment reports. Note that each pair of students was working with an identical data set.

From two students examining good luck:

"The results of this experiment clearly indicate that 'good luck' can influence the outcome of a card drawing."

"This experiment proves that it is absurd to believe good luck truly has an effect on the outcome of life."

From two students examining horoscope predictions:

"Overall the results favored the skeptics."

"We found the results to be skewed in support of the predictions."

From two students examining results of a rolled die with six faces:

"In general, the results show that there is a subtle psychic ability within almost every test subject."

"It was concluded that any positive prediction or act of telekinesis was based solely on chance."

After the reports were turned in, copies were made that were labeled by letters (A through M) and did not include student names. Each student then received a package including every student report and an evaluation form. The form had spaces for ranking the experiment reports, and a space for each letter. Students were required to rank the reports on three attributes: Presentation of Results, Discussion of Results, and Overall Persuasiveness. In addition, students were required to write one positive comment and one negative comment about each of the other reports. To encourage students to make tough decisions, the reviewing form did not allow ties between reports. To avoid the complications of requiring students to rank their own papers, only 12 spaces were present in each ranking section on the form.

In order to help students feel more empowered, the instructors mostly refrained from giving definite guidelines on what makes a scientific article good or bad. Instead, the instructors emphasized the overall effect on the reader as the main priority. Is an article persuasive? Are all of the relevant data shown, or are some hidden? Does the language indicate the conclusion of the author, without making the author sound too biased? Most of the discussion time was spent by having students describe their own ideas about what makes a good scientific report, and then discussing where students agreed and disagreed.

After students completed their individual reviewing and ranking forms, each group formed a review panel in which they developed a consensus ranking for all 13 papers and compared their comments on the papers. While it was expected that the groups might unconsciously rank the papers on their topics higher than the other groups' papers, there was only a statistically insignificant average difference of one ranking position between the ranking a group gave one of its papers and the mean ranking the other groups gave the paper.

The review panels presented to the class their rankings of the papers and justified their decisions. The instructors then led a discussion of the student opinions of the reports, focusing on why certain papers were ranking consistently at the top among the groups and why some papers were ranked high by some groups and low by others. Because students had already read every report, they had plenty of comments to share. Many expressed surprise at the variety of criteria that had been used to rank the reports, and at the number of different forms of persuasive writing present in the reports.

After collecting the reviewing forms, the instructors compiled two types of information: the numerical ranking of each paper in the three categories, and a summary of the positive and negative comments made by other students. Each student then received only the numerical rankings and comments related to his or her paper. Students used this information to revise their reports and then resubmit them.

The grade incentives to perform well in this honors seminar were relatively modest. Students were told that if they completed all of the assignments and participated in class discussions, there would be no effect on their grade in the main course. If their initial report or their revised report was very good, then they would receive a small amount of bonus

points added to their total for the main course. This lack of high stakes was intended to reduce the overall stress of the peer-review assignments, and was desired partly because the peer-reviewing discussions were expected to be an unfamiliar experience for most students.

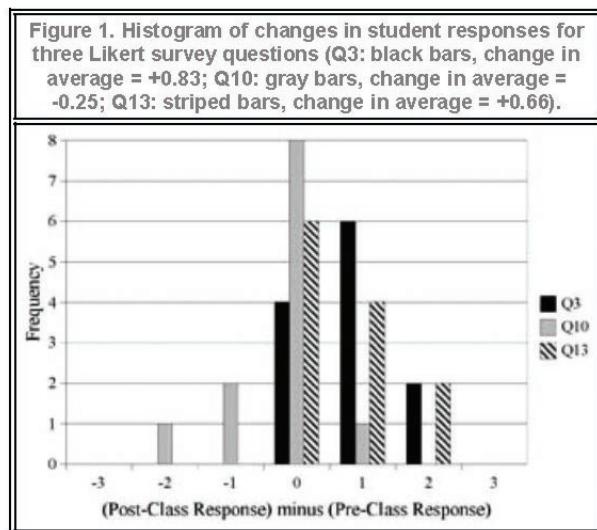
To evaluate the effect of the course on student attitudes, Likert-style written surveys were given to students during the first and last class sessions. Student surveys have been useful in the past in evaluating student attitudes toward physics and physics instruction (Redish, Saul, and Steinberg 1998; Lederman et al. 2002; Siegel and Ranney 2003). Table 1 compares the averages of results from 12 students who completed both the pre-class survey and the post-class survey. Asterisks indicate differences that are statistically significant with a 95% confidence level according to a two-tailed direct difference *t*-test method.

**Table 1. Science Empowerment Survey results.** The survey form instructed students to indicate their level of agreement with each statement (Strongly Disagree = 1, Strongly Agree = 5). Survey result averages for 12 students are shown. Asterisks indicate differences that are statistically significant with a 95% confidence according to a two-tailed direct difference *t*-test.

	Pre/Post	Change	<i>t</i> value
(1) I am confident that I can form a good opinion about science reports I see in the news.	3.08/3.83	0.75	2.28*
(2) I generally understand how science results are generated.	3.33/4.17	0.84	3.08*
(3) With enough time, I am capable of designing experiments to test the accuracy of scientific statements I encounter in daily life.	3.50/4.33	0.83	4.02*
(4) Performing research is an emotional experience for a professional scientist.	2.92/2.75	-0.17	-0.8
(5) Scientific journal articles are objective reports of the experiments.	3.00/2.83	-0.17	-0.62
(6) Since professional scientists know a lot of factual knowledge, their opinions on scientific matters should usually be believed.	3.00/2.75	-0.25	-1.39
(7) Since professional scientists are frequently evaluated by their peers, their opinions on scientific matters should usually be trusted.	3.00/3.42	0.42	1.82
(8) When evaluating the accuracy of a report, the amount of peer review performed on the scientist or the report is a good indicator.	3.42/3.92	0.5	1.59
(9) Being driven by curiosity, most scientists perform their research according to their own plan, with little consideration about the peer-review process.	2.33/2.42	0.09	0.43
(10) If a smart author produces a slanted scientific report, I am unlikely to detect the slant.	3.25/3.00	-0.25	-1.15
(11) Scientific results do not need to be presented in an X-Y graph format to be convincing.	3.17/3.75	0.58	1.4
(12) An X-Y graph format is usually the best way to present scientific results.	3.17/3.33	0.16	0.62
(13) If a friend expressed belief in a paranormal ability, I could design an experiment that would be a good test of its validity.	3.67/4.33	0.66	2.97*
(14) Scientists' research reports show the bias of the researchers.	3.33/3.25	-0.08	-0.25
(15) The peer-review process guarantees that science papers are accurate.	2.67/2.67	0	0

The results indicate an increase in student empowerment concerning science interpretation (questions 1, 2, 3, and 13). Although the number of responses is small, histograms displaying the changes in responses (see Figure 1) provide some reassurance that the effects are real. While the response differences for other questions are not significant at a 95%

confidence level, the trends are still interesting. For example, the responses to questions 7 and 8 are, at the very least, consistent with an increase in respect for the value of peer review. The lack of large changes in the other questions (4, 5, 6, 9, 10, 12, 14, and 15) is somewhat reassuring, since it suggests that students answered the questions after some deliberation, rather than trying to interpret what was the desired answer and then shifting their post-class responses in that direction.



At the end of the seminar, students were asked to be interviewed about the class. Of the 13 students, interviews with 7 were performed and audiotaped by the postdoctoral researcher. While this allowed the researcher to guide and interpret student responses directly, it is recognized that it could have led to students answering in ways that would satisfy the researcher. The interview results agreed with the survey results in many ways. Students expressed surprise that there was such a variety of ways to slant scientific reports. They also stated that they hadn't expected that such convincing and contradictory reports could be produced from a single set of data. As expected, having to interpret scientific reports that present the same data in very different ways was a new experience for students. For example, one student commented:

"Having that double slant, half the group going one way and half the group going the other way, I think it kind of explained why everything ... needed to be so double-checked and triple-checked...."

This student also said that the contradictory reports "opened up a new way of thinking" by letting students see how the same results can be presented differently. Students also stated that after taking the class they were more confident that they would be able to notice bias in media articles. For example, when asked what kind of skill this class helped develop, a student responded, "I think I could certainly point out fallacies easier now, in research."

## Discussion

This course was intended as a pilot study that could lead to implementation of similar assignments in a standard college

or high school physics class. Of course, the use of peer-review assignments does not need to involve paranormal claims. One approach for using peer review would be to assign students to write lab reports on traditional topics, but require different students to present the same set of data in contradictory ways. For example, students could be assigned to write reports that advocated for or against the position that linear momentum is conserved during collisions. Then students could perform peer review and see firsthand how it is possible to slant reports while appearing objective. One issue that might need to be modified is the grading incentive for students to fill in the peer-review form after reading the other students' reports. Even though students in the class presented here were not given extra grading points depending on how diligently they performed the reviewing task, it appeared that all students had taken the assignment seriously. In larger classes that do not consist entirely of honors students, it is likely that grade incentives would be helpful in ensuring students take such assignments seriously.

## Conclusion

We have demonstrated the use of peer review in an undergraduate physics seminar class to teach students about the scientific process in a way that encourages a feeling of empowerment concerning scientific information. Students performed many parts of the scientific process, including literature review, experiment proposal, refinement of experimental plan, data acquisition, report writing, written peer review, group discussion peer review, and report revision. One innovative feature was the assignment for students to include a slight amount of advocacy or bias into their written reports, which were then reviewed by the other students. Survey and interview results indicate that after the class, students felt more confident about their abilities to evaluate scientific reports and to detect bias.

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## Acknowledgments

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# APPENDIX F

## COSMOS/NWO Outreach Activities

### 2005-06 COSMOS/NWO-Related Professional Activities

Presenter	BGSU Position	Presentation/Activity	Location	Time and date	Topic	Audience	Number
Jim Albert	Professor, Math & Stat	Beyond the AP Statistics Workshop	BGSU	4/22/05 8:30-1:00	Mathematics	High School Teachers	3 Teachers/ 22 Total
Jodi Haney & Mandy Heddle	COSMOS Director & Visiting Asst Prof, Env Science/ COSMOS	Maumee Schools: Celebrating the Arts of the Earth	Fort Miami Elementary School, Maumee, OH	4/21/06	Env. Science & Art	K-6 Students	300
Mandy Heddle	Visiting Asst Prof, Env Science/ COSMOS	Hot & Bothered over Global Warming: Students' Misconceptions in ENVS	Honolulu, HI	1/7/06 4:20	Science, Inquiry	University Faculty	7
Mandy Heddle	Visiting Asst Prof, Env Science/ COSMOS	RTOP Calibrations	San Diego State University	1/20/06- 1/22/06	Science, Assessment, and Inquiry	University Faculty	9

Presenter	BGSU Position	Presentation/Activity	Location	Time and date	Topic	Audience	Number
Mandy Heddle	Visiting Asst Prof, Env Science/ COSMOS	Insect Island	Montessori School	1/27/06	Science	K-12 Classroom Teachers, 6th gr students/prism fellow & teacher	13
Mandy Heddle	Visiting Asst Prof, Env Science/ COSMOS	Math and Science for a New Millennium	Unitarian Church, Maumee	3/15/06 7:00pm	Math, Science, and Inquiry	Community Members	10
John Laird	Professor & Chair, Physics & Astronomy	Space, Light, Stars, and Beyond	COSI	5/25/06 7:00pm	Science	Community	10
Matt Partin	Biology Instructor/ Marine Lab Director	Marine Lab Tours	BGSU Marine Lab	Multiple	Science	K-16 students	579 Fall
Michelle Shafer	COSMOS Asst Director	Maumee MS Science Teachers' Curriculum Mtg	Maumee Gateway MS, Maumee, OH	11/1/05 8-3:30	Science	K-12 Teachers, Curr Directors	7
Michelle Shafer	COSMOS Asst Director	Women in Science Day: "Take a Closer Look"	BGSU	11/11/05	Science and Inquiry	7th and 8th grade students	50
Michelle Shafer	COSMOS Asst Director	Allen County ESC Technology Conference	Bluffton High School	11/14/05 9:30-2:30	Science	K-12 Teachers, ESC Curr Directors	16

Presenter	BGSU Position	Presentation/Activity	Location	Time and date	Topic	Audience	Number
Michelle Shafer	COSMOS Asst Director	COSMOS @ BGSU-Grant Opportunities	Lima, OH	11/18/05 1:00	Math, Science, Teach OHIO and MSP recruiting/info session	Curr Directors, Administrators	20
Michelle Shafer	COSMOS Asst Director	Creating Rubrics for Standards-Based Report Cards	Maumee-Wayne Trail Elementary	11/23/05 8:30-10:30	Assessment-Rubrics	K-12 Teachers, Curr Directors	80+
Michelle Shafer	COSMOS Asst Director	East Toledo JH/Waite HS Cross Team Meeting	Tony Packos	12/1/05 3:30-5:30	Science, Curriculum, and Inquiry	K-12 Teachers	8
Michelle Shafer	COSMOS Asst Director	Developing the County Science Course of Study	Gibsonburg, OH	12/14/05 8:30-12:00	Science	K-12 Teachers, Curr Directors	20
Michelle Shafer	COSMOS Asst Director	Waite HS ETJH Cross School Meeting	Waite HS	1/30/06 3:30-4:30	Science, Curriculum, and Transition Problems Experienced by Incoming Freshmen	K-12 Teachers, Administrators	6
Michelle Shafer & Jodi Haney	COSMOS Asst Director & Director	Port Clinton City Schools Science Course of Study	Port Clinton, OH	3/23/06, 3/27-31/06	Science and Curriculum	K-12 Teachers, Curr Dirs & Adms	30
Stephen Van Hook	Asst Prof, Physics/ PRISM Director	Magnetism for Kindergarteners	Kenwood Elementary School	3/1, 3/6, 3/13, 3/15, 3/20, 3/22	Science	Kindergarten Students	60/day

# APPENDIX G

## NWO TEAMS Recruiting Brochure

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  - District Content Coaches\* will support participants' instructional endeavors.
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Funding provided by the Ohio Board of Regents and the Ohio Research Council.



### What will the professional development include?

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Dates: Monday, June 26 - Friday, July 7 (no class Monday, July 3 or Tuesday, July 4)

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  - 8 days of intensive hands-on science and mathematics experiences.
  - Co-taught by an experienced educator and scientist/mathematician teaching team.
  - Content learned will directly apply to the Ohio Standards grade level indicators and benchmarks as well as the curriculum materials of the district.

#### Academic Year Content Study Groups

- Monthly content study groups.
- Time will be spent forming collaborative professional relationships with peers while learning content and discussing implementation challenges and successes.

#### Summer Institute II (pending ODE approval)

- 4 days of hands-on science experiences at a local center of informal science education, such as the Toledo Zoo and Stranahan Arboretum.
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(all team members fill out individual applications and mail applications together)

Name \_\_\_\_\_

Team members \_\_\_\_\_

School \_\_\_\_\_

District \_\_\_\_\_

Home address \_\_\_\_\_

Email \_\_\_\_\_

Phone number \_\_\_\_\_

Grade level  3  4  5  6

I teach  math  science  both

I would like more information on sending a child to Science and Math camp  Yes  No

Number of children \_\_\_\_\_

Ages of children \_\_\_\_\_

I'm interested in receiving credit  Yes  No

Are you currently in a degree program at UT or BGSU (circle one if applicable)

I prefer vegetarian meals  Yes  No

# APPENDIX H

## NWO TeachOhio Recruiting Brochures

### Questions? & Contact

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graph TD
    Recruit[Recruit Here  
• Bachelor's Degree  
• 24 hrs in content area  
• 3.0 Undergrad GPA*  
• Desire to teach and work w/ adolescents] --> TakePRAISI[Take PRAISI II  
Completion Date June 10]
    TakePRAISI --> Summer2006[Summer 2006  
Graduate Ass't Internship  
(5.25 hrs=150 clock hours)  
9-12 credits toward  
Master's Degree]
    Summer2006 --> MustPassPRAISI[Must Have Passed PRAISI II  
Completion Test &  
30 hours in content area  
(Last Test Date Aug 5)]
    MustPassPRAISI --> GraduateAssist[Summer 2007  
Graduate Ass't Internship  
(5.25 hrs=150 clock hours)  
9-12 credits toward  
Master's Degree]
    GraduateAssist --> PrinciplesTeaching[Principles of Teaching & Learning Test]
    PrinciplesTeaching --> PassPRAISI[Pass PRAISI III]
    PassPRAISI --> May2008[May 2008  
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- No waiting! You start teaching fall 2006 in one of our partner school districts!
- Earn \$18,000 a year for the first two years and a regular teacher salary and benefit package in year three.
- Receive mentoring and professional support from your district and the TeachOhio program during the first two years of your teaching career.
- Commit to teaching in an identified Ohio district for three years (2006–2009).
- From 2006 to 2008 teach middle school or high school with an alternative license and then transfer to a provisional license for the 2008–2009 school year.

## Become a NWO TeachOhio partner district!

### Contact:

#### Julie Nurnberger-Haag

*Partner School Liaison & Recruiter  
NWO Center of Excellence in Science  
and Mathematics Education*

241 Math Science Building  
Bowling Green State University  
Bowling Green, OH 43403  
jnurnbe@bgsu.edu  
419.372.5572 or 419.372.2718

or

#### Jodi J. Haney, PhD

*Director, COSMOS  
Co-Director, NWO Center of Excellence  
in Science and Mathematics Education*

241 Math Science Building  
Bowling Green State University  
Bowling Green, OH 43403  
jhaney@bgsu.edu  
419.372.7361

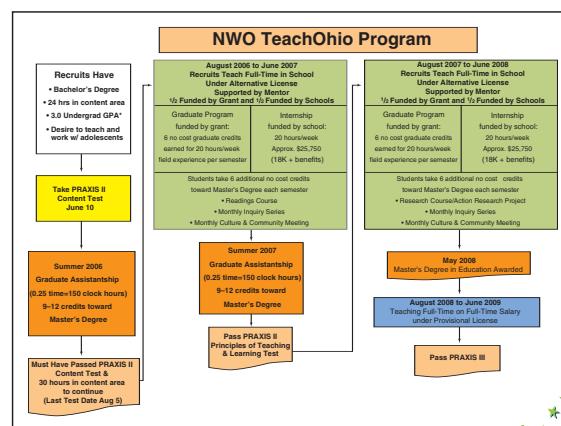


## What is NWO TeachOhio?

A grant sponsored by the Ohio Department of Education to increase the pool of highly qualified science and mathematics teachers in northwest Ohio through alternative licensure.

### Who are we recruiting?

- A cohort of 20 candidates into an alternative licensure program leading to a master's degree in education.
- Successful candidates will have at least a bachelor's degree, 24 semester hours in a science or mathematics, a 3.0 undergraduate GPA\*, PRAXIS II passage in their content area(s), and a desire to ignite adolescents' interest in science and/or mathematics while teaching a subject in which they have expertise.
- Many of the recruits who have contacted us already have a master's degree in their content area and/or substantial experience teaching in K-12 schools.
- Once candidates are admitted to the program, partner districts will have the opportunity to interview candidates whose areas of licensure match their needs and NWO TeachOhio will facilitate placements based on district and candidate needs and preferences.



\*Exceptional candidates not meeting this requirement may be considered.

<http://www.nwocenter.org>

## Those Who Can... Teach!

*Are you looking for highly qualified science or mathematics teachers?*



NWO TeachOhio can help!



is involving partners BGSU OHIO STATE UNIVERSITY TOLEDO

## What does the NWO TeachOhio plan look like?

The diagram below shows how NWO TeachOhio will help the candidates develop into highly qualified science and/or mathematics teachers...

## TeachOhio right for your district? Do you have...

- A difficult time recruiting or retaining highly qualified science and/or mathematics teachers?
- Long-term substitute teachers in science or mathematics positions?
- A need to find a replacement for a science or mathematics teacher who will retire after the next school year begins?
- A teacher with a middle childhood license who wants to gain 7-12th grade licensure in science or mathematics?
- A high percentage of students on free or reduced lunch?
- A significant number of students who are not proficient in science or mathematics?

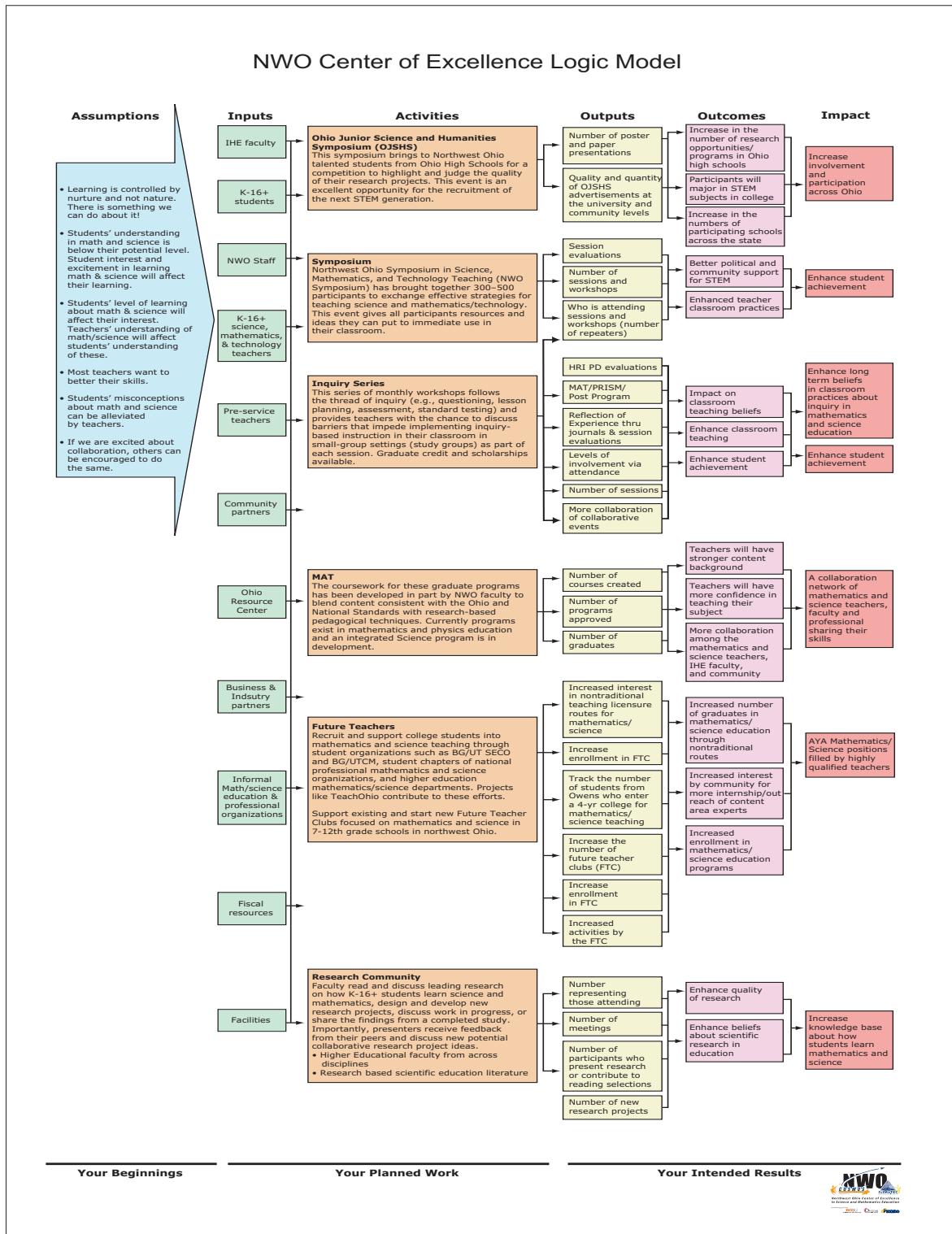
### District benefits...

- Participating in NWO TeachOhio will guarantee that some or all of your science and/or mathematics positions are filled with highly qualified teachers who may have experience in industry, research, or other fields that would enrich students' learning.
- Candidates commit to teaching in your district for at least three years.
- During the first two years, your district pays only \$18,000 a year plus benefits (approximately \$25,750).
- Students in your district will have more highly qualified teachers with strong content knowledge who will also have a master's degree in education by 2008.
- The program includes opportunities for candidates to interface with other teachers in northwest Ohio through NWO center activities. This should facilitate their development as faculty who would continue to seek these opportunities throughout their careers.



# APPENDIX I

## Logic Model



# APPENDIX J

## Executive Board Minutes

### NWO Executive Board Minutes

September 29, 2006

#### Attendees:

Anne Bullerjahn – Owens Community College, Life Sciences  
Jessica Belcher – BGSU, Graduate Assistant  
Emilio Duran – UT, Co-Director NWO, Director SciMaTEC  
Anjali Gray – Lourdes College, Department Chair, Biological Sciences  
Jodi Haney – BGSU, Director NWO and COSMOS  
Michelle Leow Klinger – COSI – Toledo, Education Director  
Linda Lower – Perstorp Polyols, Inc.  
Julie McIntosh – U of Findlay, Science Education  
Stephen Van Hook – BGSU, Physics and Astronomy  
William Weber – UT, Representing Carla Johnson, Science Education

**Not In Attendance:** Mitch Magdich – Toledo Zoo, Curator of Education; Jane McCleary, Hancock County ESC; Mary Richter, Northwest RSIT.

The meeting began with introductions from all people present. All members of the executive board received a folder with the agenda, budget information, executive summary, 2005 annual report, and a copy of the presentation. Then Jodi and Emilio gave a PowerPoint presentation that included an overview of NWO mission, goals, visions, partners, current work and accomplishments, affiliated projects and programs, new projects and an annual budget update.

During the overview, Jodi stated that she was having Jessica draft NWO Executive Board bylaws for the Board to review to utilize Jessica's Policy master's degree credentials. Jodi also stated that the role of the executive board was to serve as an advocacy group for NWO activities and to guide the direction of NWO through long-term planning. Jodi asked the executive board to generate an annual response to the final external evaluation of NWO. Individual board members will submit their comments (strengths of the center and recommendations) to Julie McIntosh, who volunteered to collect the individual reviews and summarize them in to a final letter. The reviews are tentatively scheduled to be due to Julie by November 1, 2006 and Julie will return the letter to the Jodi Haney, NWO Director, by December 1, 2006. The deadlines will be extended as needed (depending on when NWO receives the report from the external evaluators).

Julie McIntosh stated that NWO should try to work with NSTA, NCTM and other national math and science groups to start undergraduate student groups. Bill stated it would be wonderful to have undergraduates involved in these national student organizations, but student memberships are very expensive to sponsor. Michelle Leow-Klinger discussed the COSI Educator's Circle Event and COSI website that showcases the COSI Curriculum and Community Resources.

Linda asked what business could do for NWO and she talked about how in Sweden, their corporation sponsors a school that worked with students in Science and Mathematics. Emilio asked if they have their student's intern at their various sites. Jodi challenged Linda and the rest of the group to think about ways we could all collaborate and that the next meeting would be focused on discussion possible collaborations.

Emilio discussed the differences in university funding between COSMOS and SciMaTEC and how difficult it is for SciMaTEC to be able to be as productive as COSMOS without a comparable university infrastructure as COSMOS.

Jodi talked about COSMOS current initiatives: the NWO Inquiry in Science and Mathematics Series and Action Groups, the MAT scholarship program in Physics and Mathematics Education, the Research Community, and the development of the Learning Sciences PhD program. Emilio talked about SciMaTEC initiatives: the NWO Symposium for K-16 Educators, The Ohio Junior Science and Humanities Symposium, the Future Teachers Conference and the Faculty Research Associates.

During open discussion, Bill Weber asked Emilio to elaborate on how the Center could help him (and others) with the writing and implementation of an IQT OBOR grant. Specifically, he asked if NWO would write a letter of support for various applications. Jodi responded that if the proposed projects align with the mission, vision, and goals of NWO, NWO would at the very least endorse the project. NWO could also be a co-partner in the proposed project with either moderate or high-level involvement. In order for this to occur, the grant-writer would need to approach the NWO directors (Emilio and/or Jodi) well in advance to develop the collaborative partnership. Ultimately, the NWO director (Jodi) will write the NWO letter of support for these proposed projects.

The next meeting will be held in May 2007, schedules will be requested to find a time that will suit everyone's schedule.