Serving 29 Counties in Northwest Ohio

NWO

Northwest Ohio Center for
Excellence in STEM Education

2011 Annual Report

Connections | Communication | Collaboration

Fiscal Year 2011

(July 1, 2010-June 30, 2011)

www.nwocenter.org

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NWO Mission

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

NWO Vision

The Northwest Ohio Center of Excellence aims to advance science, technology, engineering, and mathematics (STEM) education for people of all ages. Our purpose is to work with community partners to (a) 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) stimulate the interest of young people, especially those in underrepresented groups, in these rewarding fields of study and career opportunities.

Partial funding provided by Ohio STEM Learning Network (OSLN)

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NWO Goals and Corresponding Activities

Goal 1: Develop the expertise of pre-service and in-service teachers in STEM and STEM education disciplines.

NWO Activities

- NWO Inquiry Series
- NWO Symposium on Science, Mathematics, and Technology Teaching (NWO Symposium)
- Undergraduate and graduate teacher preparation courses or program modification

Affiliated Activities

- Grant projects (Project pi r^2, USE-IT, etc.)
- Undergraduate professional organizations (BGCTM, BGSECO, etc.)
- Community Resources Workshop
- Continued support of the MAT degree programs

Goal 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.

NWO Activities

- Ohio Junior Science and Humanities Symposium (OJSHS)
- STEM in the Park
- Grant Projects (GRAMS, BOSEF, etc.)

Affiliated Activities

- Grant projects (ACTION, etc.)
- You Be the Chemist Challenge
- Support and assist with other university recruiting activities

Goal 3: Conduct and communicate collaborative research in STEM and STEM education disciplines.

NWO Activities

- COSMOS Research Learning Community
- Faculty presentations at NWO Symposium
- Submitting manuscripts for publication
- Faculty/staff research and participation in NWO

Affiliated Activities

- Continued support of the development of the Learning Sciences PhD program
- Grant projects

Goal 4: Develop and sustain a regional collaborative alliance including university, school, informal education, and business partners through a shared vision and collaborative spirit for tackling current STEM education issues.

NWO Activities

- NWO Collaborative Council (NWOCC)
- STEM Consortium Advisory Board & Leadership Team
- NWO website and STEM Resource Center website
- NWO newsletters (e-newsletter and print "NWO STEM Connection")
- Ohio STEM Learning Network Hub Activities

Affiliated Activities

- Community Resources Workshop
- Business and community partnerships on grant projects (Tiger Team, STeM 2 STEM, etc.)

Goal 5: Support higher education faculty and future faculty in pursuit of the best practices in STEM and STEM education disciplines to enhance undergraduate and graduate education.

NWO Activities

- Professional development for higher education faculty at NWO Symposium and NWO Inquiry Series
- COSMOS Research Learning Community
- Support for faculty development and administration of STEM education research and innovation grant projects.

Affiliated Activities

- Continued support of the development of the Learning Sciences PhD program

Educator Professional Development and Outreach

NWO Activities

Community Resources Workshop (CRW)

Brief Description

This weeklong K-12 teacher professional development workshop began in 1998 through a partnership with Toledo Museum of Art, The Blade, WGTE Public Media, University of Toledo, and Bowling Green State University. The 40-hour Monday-Friday summer workshop, currently sponsored in part by NWO and its grant programs, features visits to area organizations that focus on inquiry-based, hands-on learning in both formal and informal settings. Teachers may earn 2 graduate credits from Lourdes College and enjoy meeting education specialists from exciting places such as Toledo Zoo, Toledo Area Metroparks, Challenger Learning Center, and Toledo Lucas County Library on whom they can call for lesson plans, activities, hands-on resources, and school programming.

Meets NWO Goals: 1 & 4

FY 2011 Activity Information

In 2011, 49 teachers took part in the Community Resources Workshop (CRW) with activities delivered by Lourdes College, Toledo Area Metroparks, The Blade, The Mud Hens, Challenger Learning Center, Toledo Museum of Art, Imagination Station, Toledo Lucas County Public Library, Toledo Zoo, WGTE Public Media, and several guest speakers. Sponsors of the 2011 event included Oregon/Northwood Rotary, NWO, and Ohio Board of Regents (OBOR) through Project pi r^2. Highlights included a visit to see Lucas, the new baby elephant at the Toledo Zoo, and a walking tour of downtown Toledo, the Valentine Theater, and The Blade. In 2011, the CRW was the first leg of Project pi r^2, an OBOR grant at NWO, which provides funding for 30 teachers at CRW and over 100 total contact hours of professional development for teachers.

Continued on pages 4

Community Resource Workshop (CRW) continued from page 3

Evaluation Summary

The 2011 Community Resources Workshop was evaluated using a paper survey that was administered to 45 participants on the last day of the workshop. The results of the survey indicated that the participants perceived the workshop to be valuable and applicable to their teaching practice. As a result of attending the workshop, teachers increased their awareness of community resources and their attitudes toward using community resources in their classroom. In addition, teachers estimated that they would use community resources more during the next school year than they did during the previous school year. The teachers' written comments supported the previously stated conclusions, particularly regarding the CRW's role in increasing teachers' awareness of community resources (especially low cost alternatives to field trips). The teachers also wrote several positive comments about the hands-on nature of the workshop activities.

"NWO STEM Connection" Print and E-Newsletters

Brief Description

The NWO STEM e-newsletter and STEM Connection newsletter are focused on bringing attention to new programs and events happening in STEM K-16 education. Monthly e-newsletters feature stories about area K-12 schools focusing on STEM learning. Each month also includes a community partner feature story revealing how business and non-profit organizations are working with K-12 schools to enhance STEM teaching and learning. The STEM Connection newsletter is published quarterly. Both newsletters feature a hands-on, inquiry-based STEM activity for easy use in K-16 classrooms, upcoming teacher professional development and student opportunities, and STEM resource announcements. **Meets NWO Goals: 1, 2, & 4**

FY 2011 Activity Information

In 2010-11, NWO re-launched its STEM e-newsletters with new graphics and a hands-on learning focus. A grant from the state of Ohio enabled NWO to produce an extended print version of our e-newsletter in order to focus on more K-12 schools and higher education partners that make up northwest Ohio's 29 county area. During the 2010 school year, we published and emailed 12 e-newsletters to over 7,000 educators, administrators, partners, and stakeholders and mailed 3 print newsletters to over 5,000 educators, administrators, and stakeholders. Plans are to continue publication of STEM e-newsletters all 12 months of the calendar year and increase the number of science and mathematics educators receiving the newsletters.

Evaluation Summary

The print and e-newsletters were evaluated mainly using two online surveys – one for the print newsletters and another for the e-newsletters. A link to the online surveys was included in the first print newsletter as well as the February and May e-newsletters. Seventy-one respondents (including teachers, school administrators, and university faculty) completed the February survey, and 63 respondents completed the May survey. No respondents completed the print newsletter survey. The responses to both e-newsletter surveys indicated that people generally perceived them to be useful and attractive. Most respondents rated the e-newsletters'

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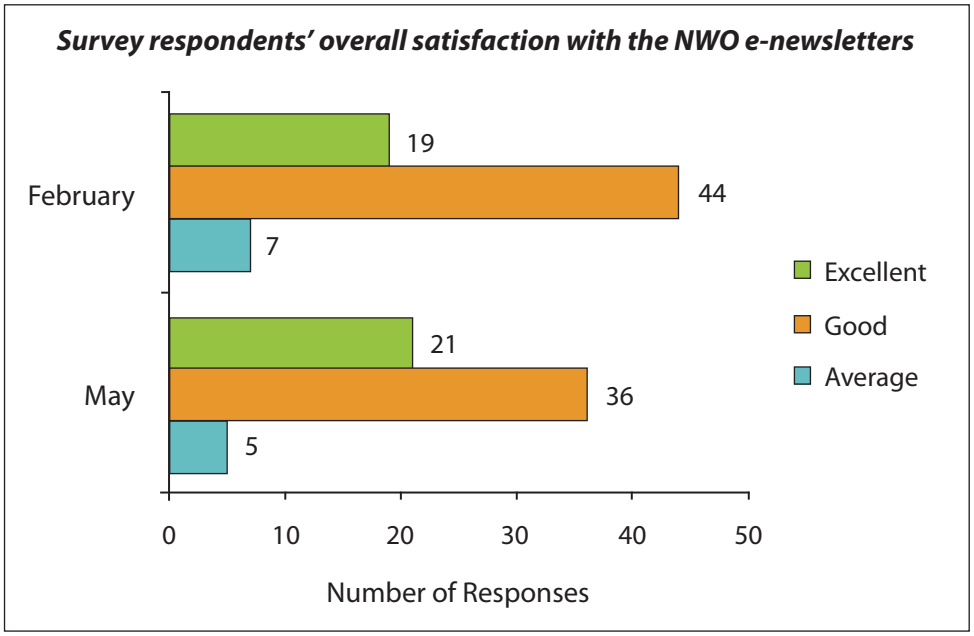
"NWO STEM Connection" Print and E-Newsletters continued from page 4

length, layout, readability, value, and overall appeal as "Good". The figure below illustrates the distribution of responses regarding the respondents' overall satisfaction with the e-newsletters.



Respondents' written comments were generally positive, and many specifically reported being pleased with the lesson plans and professional development opportunities included in the newsletters.

NWO STEM Education Inquiry Series

Brief Description

Sustained professional development is offered by NWO throughout the academic year in the NWO Inquiry Series. The Inquiry Series is a seven session series of STEM professional development workshops that continues to be highly popular with educators in the region. It also functions as a monthly platform for affiliated NWO grant projects and regional educators to come together for project-specific professional development.The Inquiry Series is open to in-service and pre-service teachers, higher education faculty, and business/community partners in the region. Participants can opt to attend only one event or all seven Inquiry Series events. **Meets NWO Goal: 1**

FY 2011 Activity Information

The 2010-11 NWO STEM Education Inquiry Series was held (for the second year) at Rossford High School on the following Thursday nights: Sept. 23, Oct. 21, Dec. 16, Jan. 13, Feb. 17, Mar. 24, and Apr. 14. Due to budget constraints, a $15/night fee was charged for all attendees with an option of pre-paying for all 7 nights at a reduced rate of $90. The fee did not reduce the overall attendance, but did provide for a reduction in the no-show rate for registration/attendance. On the following page is a list of the STEM opportunities offered at each monthly meeting and the overall attendance data.

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NWO STEM Education Inquiry Series continued from page 5

Session Title	Funding Source & Type	Grade(s)	Subject(s)	Dates Offered
Take Math Outdoors!	Participant Fees: Instructional supplies, Participant supplies; NWO: Facilitator Payment	4-8	Mathematics	Sept.-Apr.
Experiencing Engineering is Elementary (EiE)	Participant Fees/NWO: Facilitator Payment; Square One Education Network: Instructional supplies, Participant supplies	K-6	Engineering	Sept.-Dec. & Feb.-Apr.
USE-IT II	Martha Holden Jennings Foundation: Facilitator Payment, Instructional supplies, Participant supplies	3-8	Technology	Sept.-Apr.
Uncovering Student Science Misconceptions for Middle & High School Life Science Teachers	Participant Fees: Instructional supplies; DREAMS Grant: Participant supplies	6-12	Science	Sept.-Apr.
Project Wild, Project Learning Tree and More for Early Elementary	Participant Fees: Instructional supplies, Participant supplies; NWO: Facilitator Payment	preK-3	Science	Sept.-Apr.
The Blade and Toledo Museum of Art E-Resources for Classrooms	Participant Fees: Instructional supplies; NWO/Lucas County Soil & Water Conservation District: Participant supplies	K-12	Interdisciplinary	Sept.-Mar.

Participant Group	Total Attendance for 2010-11 (Unique Visitors)	Total Attendance for 2010-11
Pre-Service Educators	22	36
K-12 Educators	84	304
K-12 Administrators	1	6
Higher Ed Faculty	4	14
Community/Business Partners	12	28
NWO Staff	10	32
TOTAL	**133**	**420**

Evaluation Summary

The 2010 Inquiry Series was evaluated using an online survey that was administered after each Inquiry Series event (data were collected from seven surveys). The average number of survey responses each month was 37 with an average response rate of 83%. The survey required respondents to rate certain aspects of the Inquiry Series (e.g., engagement, value of information) as well as provide written comments regarding their experience. In general, the results demonstrate that attendees perceived the Inquiry Series to be engaging, valuable, informative, applicable, and motivating. The figure below illustrates the attendees' responses regarding each Inquiry Series session.

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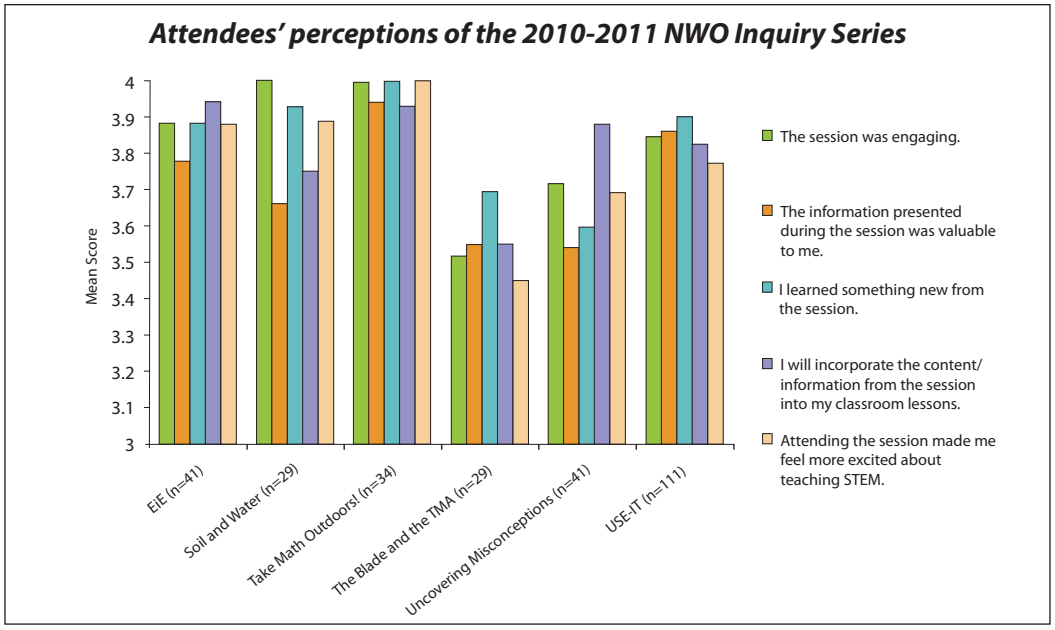
NWO STEM Education Inquiry Series continued from page 6



Note: The mean scores reflect all of the responses collected for each session during the Inquiry Series.

The attendees' written comments were mostly positive and further emphasized the value of the Inquiry Series. Attendees frequently reported using (or their plans to use) the knowledge and resources gained at the Inquiry Series in their classroom. Furthermore, the comments indicate that attendees perceived the Inquiry Series to be a high quality event, with many attendees positively commenting about the hands-on nature of the Inquiry Series sessions and the expertise of the session facilitators.

NWO STEM Resource Center Website

Brief Description

The NWO STEM Resource Center website was created as part of the STEM Consortium grant received by NWO in January 2011 from the Ohio STEM committee, the Ohio Board of Regents, and the Ohio Department of Education in collaboration with the Ohio STEM Learning Network. The website is designed to be the premier website to visit when looking for STEM teaching resources in northwest Ohio. It is designed mainly to assist preK-12 educators in locating and using STEM resources in the area. Many of the resources are available in other places on the internet, but the STEM Resource Center is designed to put all the information in one searchable database where visitors can narrow their search by many filters including geographical area, grade level(s), subject area(s), type of resources, and many more. **Meets NWO Goal: 4**

FY 2011 Activity Information

Development of the website began in January 2011 when NWO contracted WGTE Public Media to design and build a suitable website. During the six-month time frame of the grant many resources were added to the website and a beta version was launched in May for testing by the members of the NWO STEM Advisory Board. The data from this test were used to make changes to the website and the full version was launched in August 2011 for the general public. The STEM Resource Center can be viewed at **http://nwostemresources.org**.

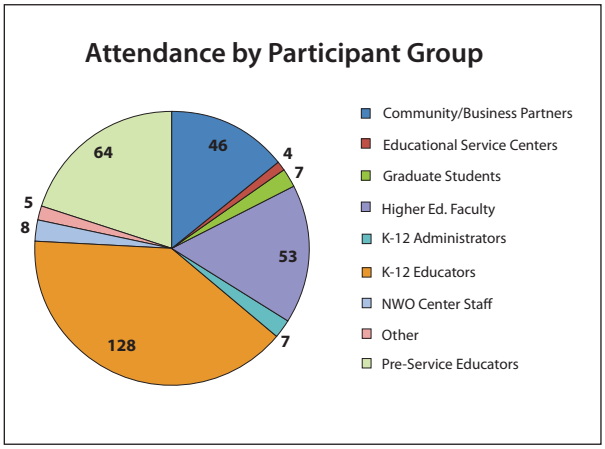
NWO Symposium on Science, Mathematics, and Technology Teaching

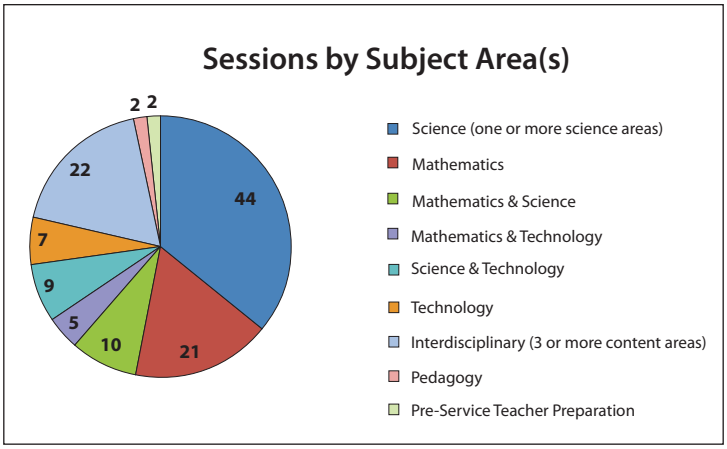
Brief Description

Over the past eight years, the NWO Symposium has brought together hundreds of participants to exchange effective strategies for teaching STEM. This popular event has provided the Center with huge visibility in the community, attracting educators to our long-term professional development opportunities and giving all participants resources and ideas they can use immediately in their classroom or setting. **Meets NWO Goals: 1 & 5**

FY 2011 Activity Information

The 2010 NWO Symposium was held on Saturday, November 6 at the Penta Career Center, near Perrysburg, Ohio for the second year. In an effort to further our partnership with Penta, we asked their Culinary Arts Program to cater the event. Due to budget restraints, a registration fee was charged for all attendees ($40 for educators and $20 for undergraduate students). In 2010, presenters and non-profit vendors were admitted at no-charge; for-profit vendors were charged a $50 booth rental fee. There was a significant reduction in attendance this year, which could possibly be a result of the fee and/or a reduction in the large-scale grants that required participants to attend the event. Below is a breakdown of the sessions offered by subject area(s) (122) and the overall attendance (322).





Evaluation Summary

The 2010 NWO Symposium was evaluated using several session evaluation surveys (attendees completed a paper survey for each session they attended) and two online surveys (one for attendees and another for presenters/vendors). The total number of responses to the attendee and presenter/vendor surveys was 116 and 86, respectively. The results of the session evaluation surveys indicated that attendees perceived the sessions to be engaging, valuable, informative, well organized, and beneficial to the educational community. In fact, more than 94% of attendees either agreed or somewhat agreed with each of the statements on the survey. The results of the attendee online survey echoed the results of the session evaluation surveys – 95% of attendees ranked the NWO Symposium overall as either Good (43%) or Excellent (52%). The figure on the next page illustrates the attendees' responses to five questions on the attendee survey.

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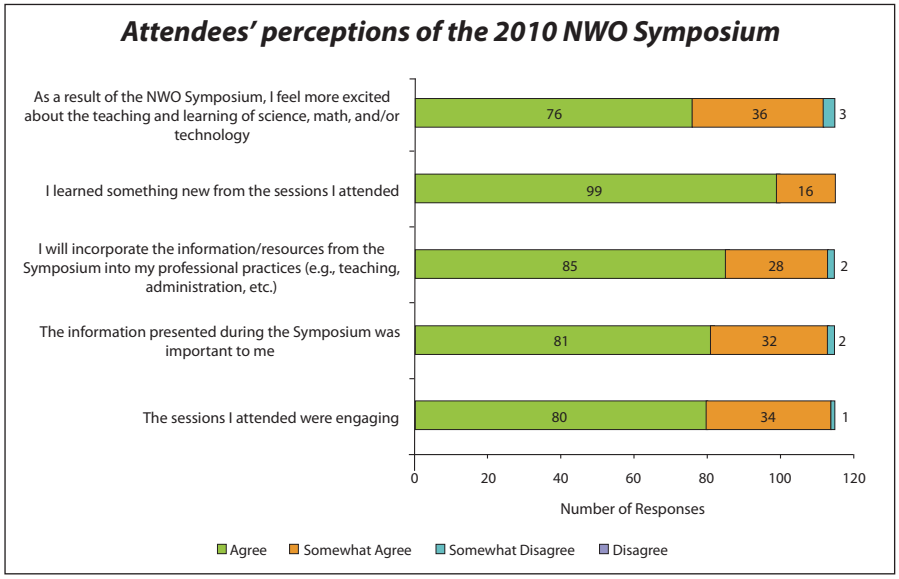
NWO Symposium on Science, Mathematics, and Technology Teaching continued from page 8



The written comments indicate that attendees appreciated the variety and applicability of the sessions. The results of presenter/vendor online survey indicated that most presenters/vendors perceived that their participation in the Symposium was worthwhile, although many were disappointed in the low attendance. Over 85% of participants reported that it was moderately or very likely that they would participate in the 2011 NWO Symposium. A complete evaluation report for this event is available at **http://nwocenter.org**.

Rural STEM Learning Platform

Brief Description

The new STEM learning platform is intended to provide a model for rural schools that struggle with the challenge of offering a rich array of stimulating and engaging STEM courses based on problem-based learning, hands-on inquiry, and partnerships with STEM businesses due to low enrollments and lack of resources. This is being overcome in part by sharing courses among multiple school districts via distance learning, video conferencing, shared staff, and inter-school visits. The new model is being developed among the nine public school districts of Putnam County, coordinated by the Putnam County Educational Service Center. This effort is based on the impressive record of achievement of these schools in their highly effective STEM programs. It will involve creating 18 new, innovative STEM courses that will be shared among all nine school districts and made available to all students throughout the county via multiple modes of distance learning. **Meets NWO Goal: 4**

FY 2011 Activity Information

The development of the Rural STEM Learning Platform began in January 2011 when the STEM Consortium grant was awarded. Putnam County ESC staff immediately began working with the schools to design courses, order/deliver materials, and setup the necessary technology to handle the e-courses. Putnam County schools launched the courses in August of the 2011-12 school year. The courses will be offered at first to only Putnam County schools, with the goal of offering courses to the entire northwest Ohio region in future years.

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Rural STEM Learning Platform continued from page 9

Evaluation Summary

The rural STEM Learning Platform was evaluated using an online survey that measured teachers' knowledge about preparedness in using problem-based and distance learning. The survey was sent to 25 teachers in Putnam County who were involved in the development of new STEM courses at their respective schools as a result of the NWO STEM Consortium funding. Twenty teachers completed the survey in February and 18 teachers completed the survey in June. The results of the pre-survey indicated that teachers were already somewhat knowledgeable about problem-based learning and were fairly prepared to use problem-based learning strategies. Teachers were not as prepared to use distance learning strategies. There were no significant changes in preparedness from February to June in the use of either problem-based or distance learning strategies. This is probably due to the fact that no formal professional development occurred until after June. Since the timeframe of the funding (January to June) only allowed for preparations, it is impossible to tell what effect the Learning Platform activities will have on teachers and their students. Further evaluation of the Rural STEM Learning Platform will be conducted in the future.

NWO Grant Projects

Partners in Inquiry Resources and Research *two* (Project pi r^2 *two*)

Brief Description

Project pi r^2 unites the resources of NWO and BGSU in conjunction with principal partner Toledo Public Schools, a high-need local educational agency, and additional partners Toledo Catholic Diocese, Challenger Center of Lucas County, Imagination Station, Sauder Village, Seven Eagles Environmental Education Center, Toledo Botanical Garden, The Toledo Zoo, Toledo Area Metroparks, and Lucas County Educational Service Center for a new model in professional development. The Principal Investigator on the project is Dr. Emilio Duran of Bowling Green State University's School of Teaching and Learning. The program's overall objectives are to (a) help retain and support teachers in science and technology; (b) expose teachers to effective models in science instruction; (c) integrate educational resources in the region's classrooms to model inquiry and increase class time spent on STEM subject areas; (d) improve student inquiry science process skills and science achievement; and (e) promote the use of research-based best practices in science teaching in northwest Ohio classrooms consistent with local, state, and national standards. **Meets NWO Goal: 1**

FY 2011 Activity Information

Funded by a $108,030 Ohio Board of Regents Improving Teacher Quality grant that spans across FY 2011 and FY 2012, this project provides 30 K-6 teachers with 100 hours of thorough and sustained professional development and reaches over 1,200 students in high-need schools with state-of-the-art inquiry science education. Participants started the project in June 2011 with a week-long professional development opportunity called the Community Resources Workshop. Participants continue with the program through AY 2011-2012 by attending professional development as part of the NWO Inquiry Series and receive six free classroom programs from area partnering outreach providers.

Tiger Team

Brief Description

Tiger Team 2010 is a partnership grant with Challenger Learning Center of Lucas County (CLCLC), the Lucas County Educational Service Center, and NWO. This project is designed to engage Ohio public school teachers and students in a robust on-site and distance-learning curriculum that bridges the informal science education community and public middle schools and high schools and is built upon ongoing university educational research and Ohio Academic Content standards. CLCLC developed the Apollo 13 scenario, which focuses on 21st Century Skills practiced through inquiry-based problem solving using an actual historic event as the context for the activity. Teachers learn practical applications of inquiry teaching, gain confidence using technology, use inquiry-based teaching methods and resources to improve student understanding, and increase their science, mathematics, and social studies content knowledge. Students benefit through exciting Challenger on-site missions or hands-on distance learning activities with peer interaction that encourages critical thinking and improves content knowledge in science and mathematics. **Meets NWO Goal: 1**

FY 2011 Activity Information

Major activities included a one-day professional development and technology training for 16 teachers, regular support and communication online (via wiki or blog) among mentor and new teachers, 8 on-site programs for approximately 240 students, 16 distance programs for approximately 480 students, study and implementation of Skype and WebEx delivery methods for distance learning and the development of formative assessments for the Tiger Team curriculum and evaluation instruments to gauge the success of the program.

NWO Role in Tiger Team in FY 2011

- Advertisement/recruitment of teacher participants via Constant Contact to ~ 7,000 regional K-12 contacts
- Advertisement/recruitment at NWO Inquiry Series
- Program evaluation
- Technology and curriculum consultation

Evaluation Summary

Tiger Team 2010 was evaluated using several data collection methods, including teacher surveys, observations, and a student content test. These data were used to evaluate the quality of the professional development, teachers' attitudes toward distance learning, and students' knowledge about space history, science, and mathematics. The evaluation findings indicated that Tiger Team 2010 was successful in providing valuable professional development and distance learning opportunities that a) improved teachers' attitudes toward and aptitude for distance learning, b) successfully engaged students in inquiry-based problem solving activities, and c) improved students' knowledge of space history, science, and mathematics. The figure below demonstrates the changes in students' content knowledge over the course of the project. A complete evaluation report for this program is available at **http://nwocenter.org**.

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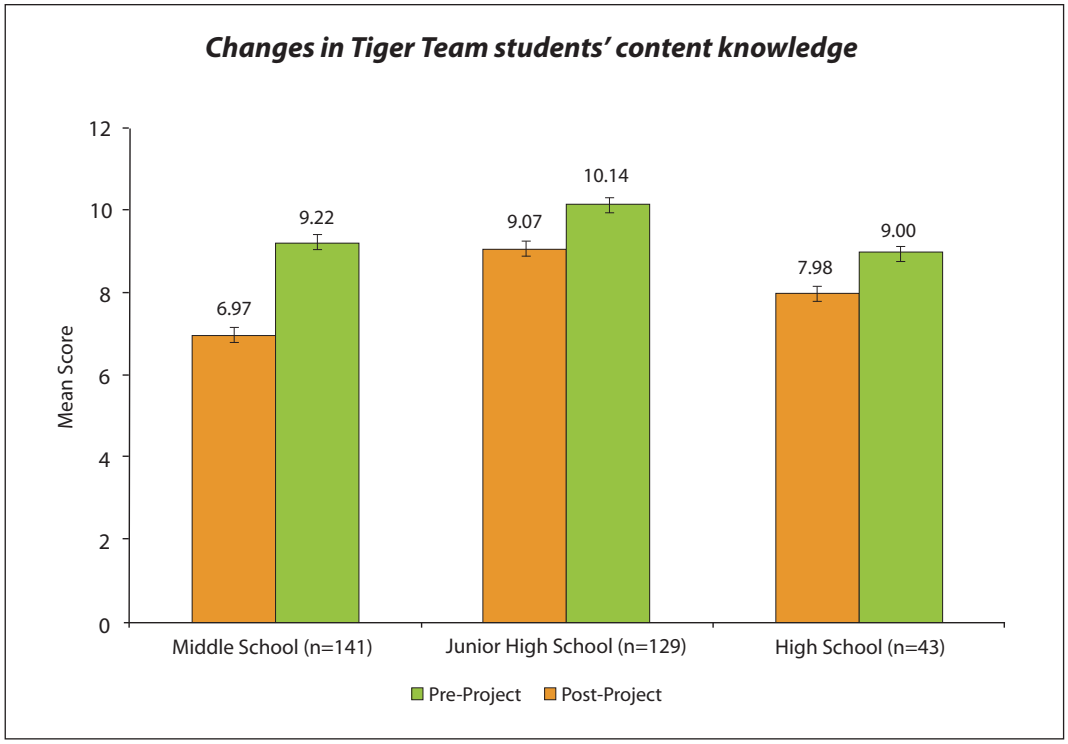
Tiger Team continued from page 11



Uniting Science, Education, Inquiry, and Technology II (USE-IT II)

Brief Description

Project USE-IT II is a partnership grant with WGTE Public Media from the Martha Holden Jennings Foundation for K-8 educators interested in infusing more technology and inquiry-based pedagogy into their science lessons. The Principal Investigator is Dr. W. Robert Midden, NWO Director. The project was aimed at helping teachers (1) gain confidence and proficiency in teaching science content using technology; (2) gain new tools to use with already existing classroom technology; and (3) increase their comfort level with science teaching and using technology to meet the diverse needs of their students. K-8 students benefit from this project through the availability of (a) new technology tools in the classrooms that allow students to utilize technology to its fullest potential; (b) hands-on, minds-on science lessons and activities; and (c) proficient teachers who encourage critical thinking, as well as instill enthusiasm for the study of science and technology in the 21st century classroom. Teachers receive professional development contact hours, science infused technology training, and hands-on technology to take back to their classrooms for completing the program. **Meets NWO Goal: 1**

FY 2011 Activity Information

USE-IT II was funded by a grant from the Martha Holden Jennings Foundation in the amount of $21,200. Through USE-IT, 24 grades K-8 public school teachers learned practical applications of inquiry teaching and learning. Each of the participating teachers received 30 hours of hands-on professional development during NWO's school year professional development, the NWO STEM Education Inquiry Series, with facilitators from WGTE Public Media

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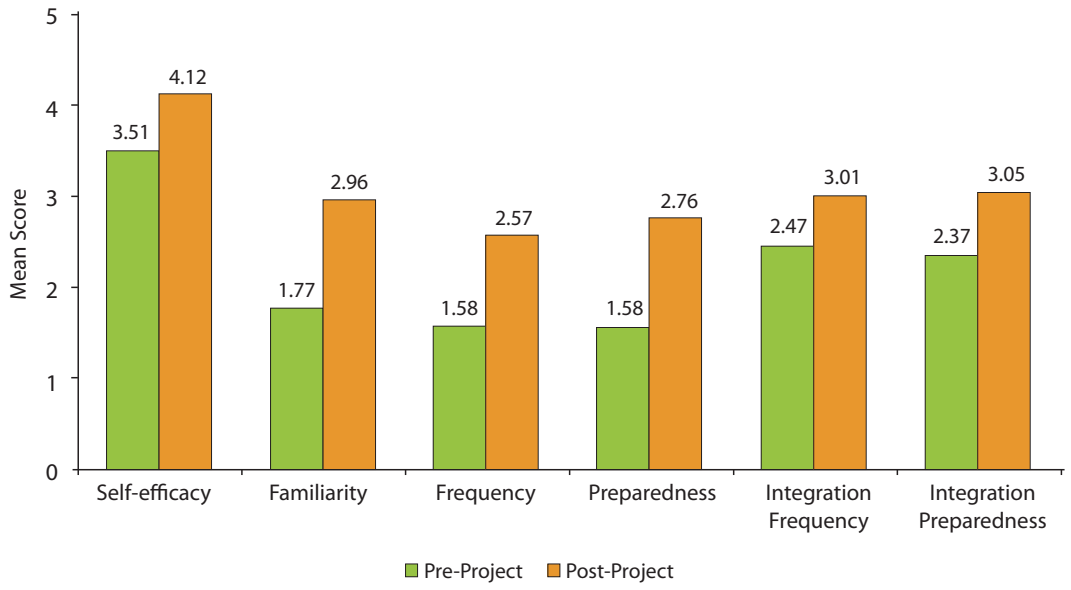
USE-IT II continued from page 12

and area mentor teachers. In FY2011, the training included equipment such as digital video cameras and resources such as Google Sites to implement technology into the teaching of science directly into their classrooms.

Evaluation Summary

USE-IT II was evaluated using several data sources, including professional development observations and three online surveys that measured the participating teachers' perceptions of the professional development, beliefs, and behaviors regarding science teaching, and beliefs and behaviors regarding technology integration. The observational and survey data indicated that the sessions were high in quality, with facilitators using an inquiry-based hands-on approach to address content that the teachers perceived to be valuable and applicable to their classroom. Furthermore, the teachers' survey responses indicated that the introduction of knowledge and resources from USE-IT resulted in classroom lessons that were more interactive and student-centered. The results of the science teaching survey demonstrate that USE-IT II positively influenced teachers' beliefs about science teaching. After USE-IT II, teachers believed reform-based science instructional strategies to be more important and felt more prepared to use the strategies than before the project. The results of the technology integration survey were more dramatic, demonstrating statistically significant improvements in every belief and behavior that was measured. After USE-IT II, teachers a) felt more self-efficacious about integrating technology in their classroom, b) were more familiar with the technology addressed during the project, c) used the technology addressed during the project with greater frequency, d) felt more prepared to use the technology addressed during the project, e) used technology integration and 21st century learning strategies with greater frequency, and f) felt more prepared to use technology integration and 21st century learning strategies. The figure below illustrates the changes in the teachers' beliefs and behaviors regarding technology integration as a result of participating in USE-IT II. A complete evaluation report for this event is available at **http://nwocenter.org**.

Changes in USE-IT teachers' beliefs and behaviors regarding technology integration



Note: Self-efficacy was measured on a scale of 1-5, while the other variables were measured on scales of 1-4.

Faculty Professional Development and Collaborative Education Research

COSMOS Research Learning Community

Brief Description

Faculty with a common interest in the science of STEM teaching and learning come together throughout the academic year to critique and discuss research articles, participate in action research, and design, conduct, and present collaborative research projects related to NWO/COSMOS goals and activities.

FY 2011 Activity Information

The 2010-11 faculty learning community "Improving Student Learning with STEM Education" emphasized the importance of basing efforts to improve student learning on rigorous evidence, sound reasoning, and peer review research rather than haphazard efforts based solely on anecdotal or personal experiences. It focused on discovering the best teaching and learning strategies for improving student motivation and engagement so as to increase academic achievement through rigorous research. Participants were involved with the STEM education literature as both consumers and contributors. They developed a rigorous action research project aimed at collecting evidence and submitting this evidence for publication in a peer-reviewed science education journal so as to advance STEM teaching and learning. The title and author(s) of the four collaborative articles developed this year are listed below. Abstracts for these projects are available in the technical evaluation report in **Appendix L**.

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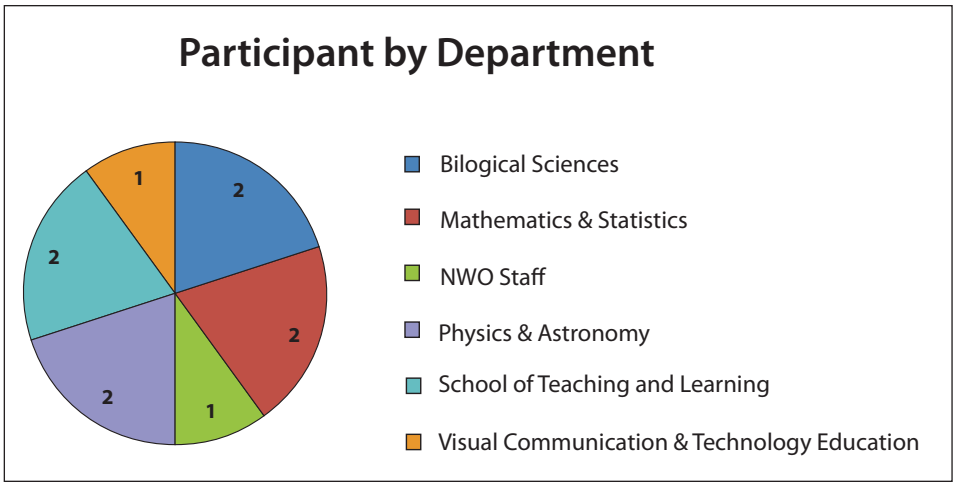
COSMOS Research Learning Community continued from page 14

Articles prepared for peer review:

1) **Title:** Developing and Validating an Instrument to Measure Motivation, Engagement, & Attitudes in College Biology
   Authors: Matthew L. Partin, Eileen Underwood, & W. Robert Midden
2) **Title:** Use of Help Sheets on Exams to Motivate Students in College Algebra
   Authors: Beth Burns & Lindsey Haubert
3) **Title:** Technology Integration in Early Childhood Science Education
   Authors: Rick Worch, Lan Li, & Terry Herman
4) **Title:** Effectiveness of In-Class Activities on Student Learning and Motivation in Introductory Astronomy
   Authors: Kate Dellenbusch & John Liard

Participation in the COSMOS Research Learning Community shows a diverse group of faculty participants from 6 university departments and 3 corresponding colleges (Arts and Sciences, Education, and Technology). The community consisted of 10 regular attendees and met bi-weekly throughout the academic year.



Evaluation Summary

The COSMOS Research Learning Community (RLC) was evaluated using an online survey that was completed by the members of all learning communities campus wide. (Only the responses of the members of the COSMOS RLC were analyzed for this report.) Seven members of the COSMOS RLC completed the survey, most of whom were associate professors who had worked at BGSU for 11 years or longer. Overall, the members of the COSMOS RLC reported that the RLC "felt like a community" and indicated that the meetings were well organized and provided lines of communication that were "open and strong." In addition, the results of the survey demonstrate the success of the COSMOS RLC in improving its members' teaching practices. More than 70% of the respondents agreed or strongly agreed that their participation in the RLC resulted in the use of new pedagogies and learning strategies in their classes and that the RLC was useful for increasing student learning. Furthermore, 67% of respondents agreed or strongly agreed that the RLC resulted in an increase in the number of learner-centered activities in their classes. Lastly, all of the respondents predicted they would likely participate (as either a member or facilitator) in a learning community next year.

COSMOS Team and Research Dissemination

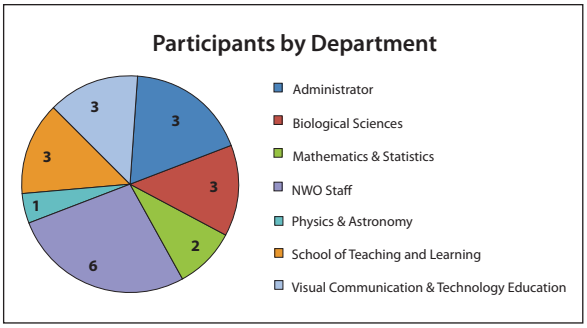
Brief Description

The Center Of excellence in Science and Mathematics education: Opportunities for Success (COSMOS), the BGSU branch of NWO, hosts the bi-weekly COSMOS Team meeting for BGSU faculty and administrators to work with NWO staff to communicate, collaborate, and champion STEM initiatives at BGSU and throughout the northwest Ohio region. This enthusiastic and supportive group has been meeting as a formal group for over 9 years and is committed to advancing STEM education for people of all ages. **Meets NWO Goal: 3**

FY 2011 Activity Information

Participation in the COSMOS Team shows a diverse group of faculty participants from 6 university departments and 3 corresponding colleges (Arts and Sciences, Education, and Technology). The team consisted of 22 total attendees and met bi-weekly throughout the academic year.

A total of 3 refereed presentations and 14 refereed publications focusing on STEM education were accomplished during FY 2011 by COSMOS Team members. A full list of presentations and publications is available in **Appendix J**.

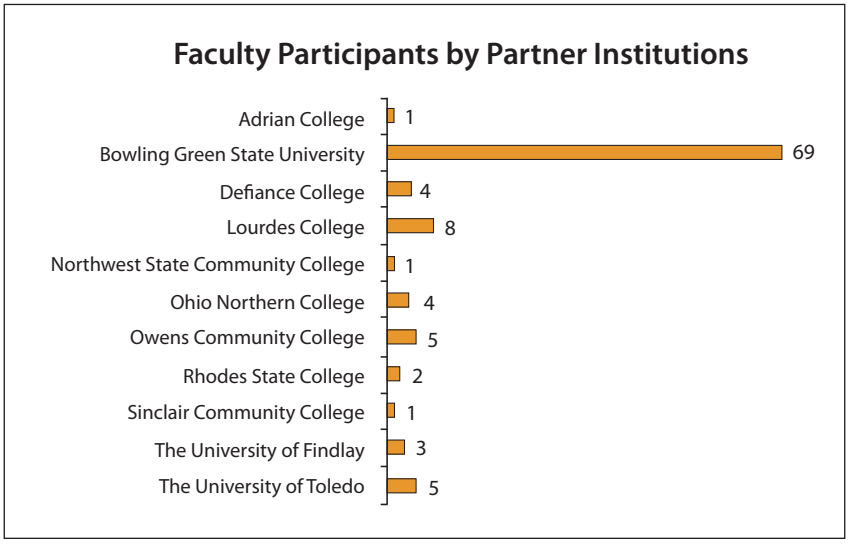


NWO Faculty Participants

Brief Description

NWO has partners in colleges and universities all over northwest Ohio. These faculty assist NWO in many ways, including participating in and/or presenting at the following NWO events: (a) NWO STEM Education Inquiry Series, (b) NWO Symposium, (c) STEM in the Park, (d) OJSHS, (e) STEM Consortium Advisory Board and Leadership Team, (f) COSMOS Research Learning Community, and (g) COSMOS Team. **Meets NWO Goals: 3 & 5**

FY 2011 Activity Information



K-12 School, Business, and Community Activities

Business and Community Partners

Brief Description

NWO impacts and works with collaborative partners all over northwest Ohio. Many institutions have become formal partners. Below is a list of some of our most active partners during FY 2011. A complete list of partners as well as the application to become an NWO partner is available at **www.nwocenter.org/partners**. **Meets NWO Goal: 4**

FY 2011 Activity Information

School Districts

These are the main district collaborations, as cited in our current grant projects; however, we recruit/disseminate to 29 counties.

- Bowling Green City Schools
- Findlay City Schools
- Fort Recovery Local Schools
- Four County Career Center
- Lima City Schools
- Maumee City Schools
- New Bremen Local Schools
- Penta Career Center
- Perkins Local Schools
- Perrysburg Exempted School District
- Putnam County Schools (9 School Districts)
- Rossford Exempted Village School District
- Springfield Local Schools
- St. Henry Consolidated Local Schools
- Sylvania Local Schools
- Toledo Public Schools
- Vanguard-Sentinel Career Center
- Sandusky City Schools

Businesses

- Ball Corporation
- BP-Husky, LLC
- Carolina Biological Supply
- Delta Education
- Educaching
- Libbey Glass
- Mother Hubbard's Learning Cupboard
- Perstorp Polyols, Inc.
- Sheridan Worldwise
- Texas Instruments
- Toledo Zoo
- Tony Packo's

Continued on page 18

Business and Community Partners continued from page 17

Educational Service Centers	Community
• Hancock County • Lucas County • Mid-Ohio • North Central Ohio • Northwest Ohio • Putnam County • Shelby County • Wood County	• Armstrong Air and Space Museum • Challenger Learning Center of Lucas County • Fort Meigs: Ohio's War of 1812 Battlefield • Imagination Station • Lucas County Soil and Water Conservation District • Northwest Ohio Educational Technology (NWOET) • Sauder Historical Village • Toledo Area Metroparks • Toledo Blade • Toledo Botanical Gardens • Toledo Museum of Art • WGTE Public Media
State Support Teams	
• Region 1 • Region 6 • Region 7	

NWO Collaborative Council (NWOCC)

Brief Description

K-12 administrators and school educators, higher education faculty, business and non-profit partners, and NWO staff meet seven times per year to communicate needs, share opportunities and research, and determine mutual goals, objectives, and strategies to advance science, technology, engineering, and mathematics (STEM) education for people of all ages. **Meets NWO Goals: 3 & 4**

FY 2011 Activity Information

Meetings took place October 7, 2010 at Imagination Station, November 4, 2010 at Challenger Learning Center, December 2, 2010, January 6, 2011, and February 3, 2011 at BGSU, and May 5, 2011 at Sauder Historical Village of Lucas County. Below is attendance data (by participant group) for the FY 2011 meetings.

Participant Group	Total Attendance for 2010-11 (Unique Visitors)	Total Attendance for 2010-11
Educational Service Centers & State Support Teams	1	4
School Districts	10	18
Institutions of Higher Education	1	1
Community/Business Partners	7	15
NWO Center Staff	2	10
TOTAL	**21**	**48**

Ohio Junior Science and Humanities Symposium (OJSHS)

Brief Description

OJSHS brings the best and brightest talents from Ohio middle and high schools together for a competition to highlight and judge the quality of their research projects in the sciences and humanities. This event is an excellent opportunity for the recruitment of the next generation of scientists, mathematicians, engineers, and teachers. OJSHS is co-sponsored by NWO and a grant from the Academy of Applied Science. Oral and poster presentations by these students demonstrate a level of achievement that would rival some of the very best junior and senior undergraduate students with some even approaching what is expected of beginning graduate students. Past Ohio winners have gone on to win the top award at the National competition, demonstrating the extraordinary talent and achievement of these students. **Meets NWO Goal: 2**

FY 2011 Activity Information

Bowling Green State University hosted the 3-day 2011 event for the third year in a row from March 23-25. For the first time in OJSHS history, participants were charged a $25 registration fee. This fee was actually recommended by parents and teachers to help cover the costs of running the symposium. Despite the fee, participation at this year's event was higher than previous years with more local students competing in the poster presentations. The keynote address was presented by Dr. Gene Poor, a professor in the Marketing Department at BGSU. There were 24 paper presentations and over 40 poster presentations. Austen Mance from Sylvania Southview High School was the 1st place winner for paper presentations with his project titled "The Effect of High School Students' Ability to Delay Gratification on Personal Associations." Austen, along with five other OJSHS winners from both the paper and poster categories traveled to the National JSHS in San Diego, California in April 2011. Dr. Emilio Duran, Assistant Professor in Education and Biology, and Dr. W. Robert Midden, NWO Director and Associate Professor in Chemistry, worked together this year as co-directors of the Symposium. Iris Szelagowski and Hans Glandorff acted as co-coordinators for the 2011 event with assistance from NWO staff. A complete program and other information about the 2011 OJSHS can be found at **www.ojshs.org**. Below is a breakdown of attendance data for the 2011 Symposium.

Participant Group	Total Attendance for 2010-11
High School and Middle School Students	120
K-12 Educators	9
Higher Education Faculty (Poster & Paper Judges)	36
Staff and Volunteers	20
Parents and Guests	16
TOTAL	**201**

Continued on page 20

OJSHS continued from page 19

Evaluation Summary

The 2011 OJSHS was evaluated using an online survey, which was completed by participating students, teachers, parents, paper and poster judges, and OJSHS staff and volunteers. The total number of survey responses was 80 for students and 26 for non-students. The results of the survey demonstrate that both students and non-students perceived the 2011 OJSHS as a high-quality worthwhile event. Almost all of the participants rated the 2011 OJSHS overall as either good or excellent. Furthermore, most OJSHS components (e.g., evening activities, keynote presentation, awards ceremony) were rated as good or excellent by more than 80% of participants. The survey results also indicate that the 2011 OJSHS increased student interest in STEM research and careers and provided students with opportunities to network with other students and STEM professionals. And although it is likely that most of the participating students were already interested in STEM, many non-student participants suggested that the OJSHS provided students with motivation to continue learning and conducting research about STEM. More than 80% of participants reported that is very or moderately likely that they will be involved with OJSHS next year. A complete evaluation report for this event is available at **http://nwocenter.org**.

STEM Consortium Advisory Board and Leadership Team

Brief Description

The NWO STEM Consortium Advisory Board and the NWO STEM Leadership Team were created as part of the STEM Consortium grant that NWO received from the Ohio STEM committee, Ohio Board of Regents, and Ohio Department of Education in association with the Ohio STEM Learning Network. **Meets NWO Goal: 4**

FY 2011 Activity Information

NWO STEM Leadership Team

The Leadership Team was the decision making body for the NWO STEM Consortium grant. The NWO Director, as grant PI, served as chair of the Leadership Team and was responsible for convening meetings, reporting to the Ohio STEM Committee, and ensuring successful completion of all grant objectives. This body met twice during the six month period of the NWO STEM Consortium grant and provided advice and direction for the execution of the grant project. The Leadership Team membership consisted of two representatives from the following organizations:

NWO/BGSU • Putnam County Educational Service Center • The University of Toledo • BP-Husky, LLC • Perkins Local Schools • Toledo Public Schools

NWO STEM Consortium Advisory Board

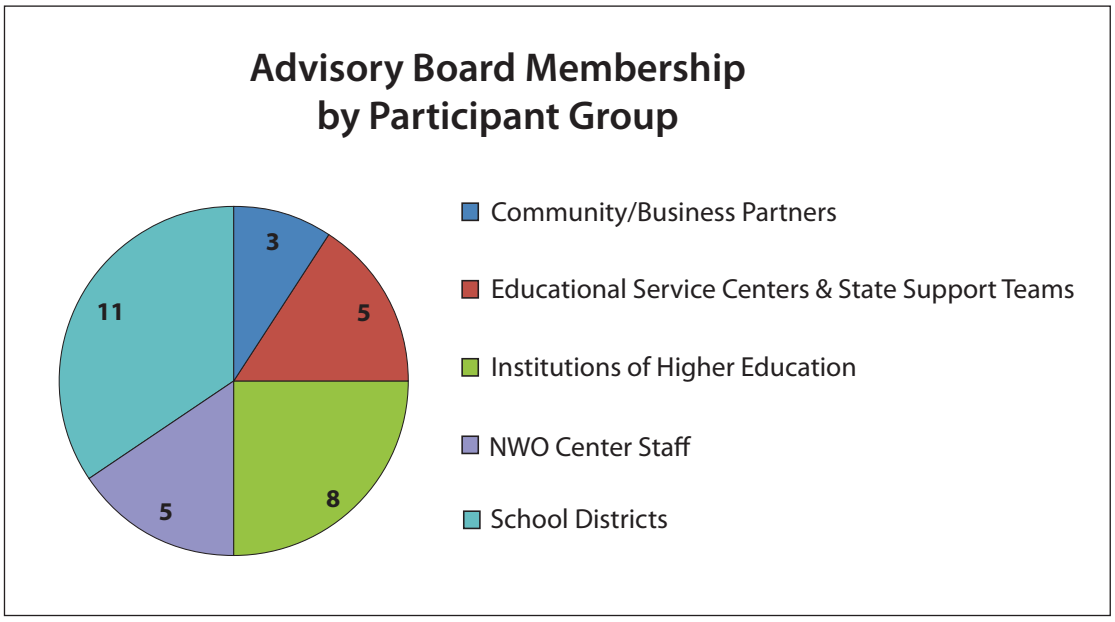
The Advisory Board advised and guided the organization, implementation, and assessment of the NWO STEM Consortium grant, ensuring that the voices of all STEM education stakeholders in northwest Ohio are

Continued on page 21

STEM Consortium Advisory Board and Leadership Team continued from page 20

heard and regional needs are met. The Advisory Board included members from several different participant groups in order to have adequate representation of all STEM constituencies in northwest Ohio.

The Advisory Board met periodically to generate ideas, provide advice regarding direction and strategies, raise awareness of opportunities, foster collaboration, form new partnerships and strengthen existing partnerships, recruit resources for new initiatives, and help to ensure that the Consortium is serving the greater good of the entire region. The Advisory Board will be continued as an NWO activity despite the ending of the STEM Consortium grant. Attendance information by participant group is available below.



STEM in the Park

Brief Description

STEM in the Park is a free NWO event for all northwest Ohio families and the entire community to stimulate public interest and encourage learning in science, technology, engineering, and mathematics (STEM). Held on the campus of Bowling Green State University, the event features three hours of engaging hands-on STEM activities from over 50 area businesses, schools, and organizations along with take-home STEM activity cards for parents and children to continue STEM exploration at home. By increasing awareness in STEM facilities, program and activities in the area, STEM in the Park is an opportunity for businesses, universities, K-12 schools, and non-profit organizations to showcase innovation, educational opportunities, and careers and to promote positive attitudes toward STEM teaching and learning. **Meets NWO Goal: 2**

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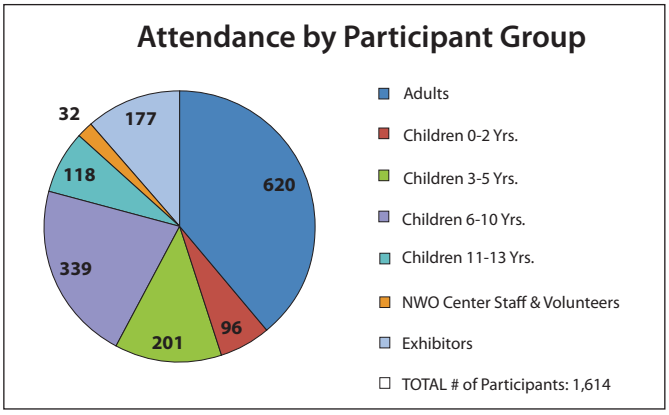
STEM in the Park continued from page 21

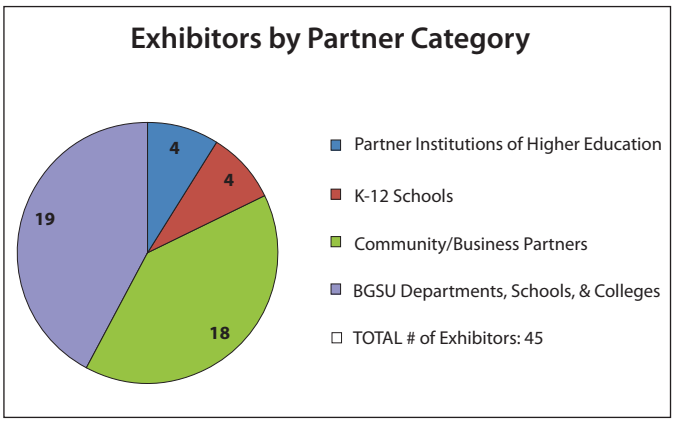
FY 2011 Activity Information

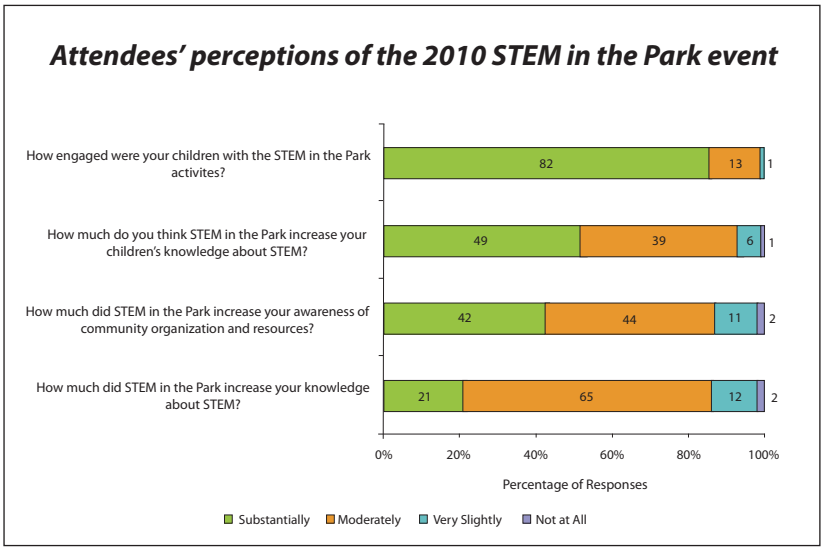
The September 10, 2010 event provided free lunch for all participants and was catered by Tony Packo's. Over 40 exhibitors were involved in STEM in the Park including many NWO community and business partners and university departments. Sponsors for the event included BP-Husky, LLC; Square One Education Network; Coca-Cola; Tony Packo's; Bowling Green Community Foundation; and BGSU. Below is attendance data as well as a breakdown of the types of exhibitors at the event. A complete list of exhibitors is available at **http://nwocenter.org/STEMinPark**



Evaluation Summary

The 2010 STEM in the Park event was evaluated using two online surveys (one for attendees and another for exhibitors). The total number of responses to the attendee and exhibitor surveys was 171 and 26, respectively. Most of the attendees reported staying at STEM in the Park for 2 hours and visiting 11 to 20 activity stations. And while only half of the attendees reported doing the take home activities that were handed out during the event, 86% reported that they would probably or definitely do some of the activities in the future. In response to the question, "What were your family's favorite activity stations," all but three stations were listed by at least one respondent, and several respondents wrote that they liked all of the activity stations. This finding indicates that the activity stations were high in quality and appealed to the preferences of many different people. The results of the attendee survey demonstrated that STEM in that Park was successful in engaging attendees in STEM activities, as well as increasing their knowledge and awareness of STEM. The figure below illustrates the attendees' responses to four of the questions on the attendee survey.





Continued on page 23

STEM in the Park continued from page 22

In addition, a majority of the attendees reported that after coming to STEM in the Park, their children were much more interested in STEM and their family was much more likely to do activities related to STEM. The results of the exhibitor survey mirrored those of the attendee survey – most of the exhibitors reported that the children and parents that visited their station were substantially engaged with the STEM activities. In addition, almost all of the exhibitors reported that STEM in the Park was a worthwhile experience, and most reported that being an exhibitor was beneficial for their organization. A complete evaluation report for this event is available at **http://nwocenter.org**.

You Be the Chemist Challenge

Brief Description

The You Be the Chemist Challenge is a fun and innovative academic competition that engages 5th-8th grade students in learning about important chemistry concepts, discoveries, and chemical safety. Challenge competitions are exciting events that take place across the country, encouraging the collaboration of community organizations, schools, and the chemical industry, as together they educate students about the benefits and value of chemistry. Ohio schools take part in local challenges within their school districts, and winners attend a state competition held in northwest Ohio to qualify for the YBTC National Challenge. **Meets NWO Goal: 2**

FY 2011 Activity Information

The Ohio YBTC Challenge competition was held April 13, 2011 from 6-8pm at Imagination Station in downtown Toledo. Area sponsors included NWO, PVS-Nolwood Chemicals, and Imagination Station. The local challenge student participants came from Toledo Public Schools and St. Joseph's School in Sylvania. Ten different schools were involved in 2011. Robert Mendenhall, Science Director for Toledo Public Schools, chaired the event.

NWO Role in YBTC in FY 2011

- Staffing support provided for event organization and planning
- Funding for student awards and certificates of participation
- Advertisement/recruitment via Constant Contact to ~ 7,000 regional K-12 contacts

Evaluation Summary

Twenty children from nine Toledo Public Schools and St. Joseph's School in Sylvania, OH participated in the event with quiz show-style programming created by PVS Chemicals, Inc. and host Imagination Station providing science demonstrations. The winner was an eighth grade young lady from Harvard Elementary School in Toledo who received a trophy, plaque, and iPod as well as a trip to the national Challenger Competition in Philadelphia, Pennsylvania sponsored by NWO and PVS-Nolwood Chemicals.

Grant Projects

Science and Math Education in ACTION (ACTION)

Brief Description

BGSU, in collaboration with three regional community colleges and The University of Findlay, received $3,000,000 in funding from the Ohio Board of Regents through the Choose Ohio First program to recruit and train undergraduates to become Ohio mathematics and science teachers. ACTION focuses on the use innovative strategies for preparing highly effective science and mathematics teachers for grades 5-12. Students involved in the project participate in: (a) a 5-week summer bridge program preceding the first regular semester of college; (b) a collaborative science or mathematics research team that addresses a real community problem or concern; (c) a co-op or internship work experience in a regional science or mathematics related business or industry; (d) early teaching experiences in a regional school; and (e) the creation of a capstone project that involves applying research techniques to determining the best teaching practices that advance the students' learning. **Meets NWO Goal: 2**

NWO Role in ACTION in FY 2011

- Advertisement/recruitment via Constant Contact to ~ 7,000 regional K-12 contacts
- Advertisement/recruitment at NWO STEM Education Inquiry Series
- Assistance with the undergraduate research component of the project
- Assistance and advice for project activities and logistics

Building Ohio's Sustainable Energy Future (BOSEF)

Brief Description

BOSEF is a scholarship project funded by the Choose Ohio First program of the state of Ohio. BOSEF increases the recruitment, training, and graduation of STEM students to supply the growing job markets in renewable energy and sustainable environment technologies.

Continued on page 25

BOSEF continued from page 24

Northwest Ohio has a growing reputation for research, development, and manufacturing in the high technology, renewable energy fields of photovoltaics (PV) and wind. In addition, northwest Ohio has major research and development strengths in environmental analysis and remediation technologies. The University of Toledo (UT), Bowling Green State University (BGSU), and the Community Colleges of Owens, Terra, and Northwest State work together to leverage the enormous public interest and burgeoning job markets in these fields to recruit, educate, and retain the best and brightest of Ohio's students to support these rapidly developing high tech professions. Student success is enhanced through a cooperative summer bridge program focused on mathematics, undergraduate research experiences for all, and integration with the Wright Center for PV Innovation and Commercialization, the Lake Erie Research Center, Center of Photochemical Sciences, and the Environmental Remediation and Restoration Experimental Park. It prepares students for scientific and technical careers by providing internships with business, industry, agencies, and non-profits in renewable energy and environmental sustainability fields. Although the primary program focus is on the undergraduate STEM pipeline, it will include PhD students and in-service high school teachers working toward MS degrees. The participating institutions have a comprehensive and vertically integrated approach to STEM education that maximizes student success and provides skilled professionals in these crucial STEM areas. **Meets NWO Goal: 2**

NWO Role in BOSEF in FY 2011

- Oversight and management of the grant project including financial management of the grant budget
- Direct recruitment of students through AIMS and the chemistry and physics departments at recruiting events
- Advertisement/recruitment to ~ 7,000 regional K-12 contacts
- Advertisement/recruitment at NWO STEM Education Inquiry Series
- Management of scholarship awards and renewals
- Student advising

Granting Access to Mathematics and Science (GRAMS)

Brief Description

GRAMS (Granting Access to Mathematics & Science) is a scholarship program supported by two 5-year grants totaling $1,200,000 from the National Science Foundation. In this project, Bowling Green State University collaborates with two regional community colleges, Owens and Terra, to increase the number of highly qualified and capable students who are able to complete degrees in STEM majors by providing approximately 20-30 need-based scholarships and a proven support program to foster student success. Student persistence and success will be fostered with two major projects: (a) our NSF-funded STEP grant project Science, Engineering, and Technology Gateway Ohio (SETGO) and (b) the BGSU Academic Investment in Mathematics and Science (AIMS). These programs include a 5-week summer bridge for entering students, to prepare them for the rigors of college science and math courses; a tiered system of mentoring by peers and faculty; learning communities with monthly events that draw students and faculty together by merging academics and social

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GRAMS continued from page 25

networking; and summer research opportunities. These strategies have been proven in BGSU's AIMS program to increase student persistence and success, particularly of under-represented minority students majoring in science and math disciplines and are based on research that has identified the factors that most account for student attrition from these disciplines. **Meets NWO Goals: 2 & 3**

NWO Role in GRAMS in FY 2011

- Oversight and management of the grant projects including financial management of the grant budgets
- Direct recruitment of students through AIMS and SETGO at recruiting events
- Advertisement/recruitment to ~ 7,000 regional K-12 contacts
- Advertisement/recruitment at NWO STEM Education Inquiry Series
- Management of scholarship awards and renewals
- Student advising

FY 2011 COSMOS & NWO Budget

Category	Expenditures		
	COSMOS Funds	Grant Funds	TOTAL
Personnel	$233,026	$240,129	$473,155
Supplies and Services[1]	$26,027	$39,888	$65,915
Travel	$126	$7,007	$7,133
Equipment	$50	$3,712	$3,763
Communication	$1,757	$14,049	$15,806
Consultants		$2,000	$2,000
Subcontracts		$833,549	$833,549
Other – Regional Grants		$2,963	$2,963
Administration (Indirect Costs)		$86,558	$86,558
TOTAL	**$260,986**	**$1,229,855**	**$1,490,841**

[1]Includes expenses for Inquiry Series, Symposium, OJSHS, STEM in the Park, You Be the Chemist Challenge, office supplies, etc.

Total Sources of Funding: $6,793,520 (includes multi-year grants)

The table below shows funding sources that supported FY 2011 NWO activities (total = $6,793,520).

Agency - Program	Description	Award Amount
Bowling Green State University Fiscal Support for COSMOS *Note: All affiliated grant projects have additional matching funds.*	• Director • Secretary • Fringes • Assistant Directors • Faculty Associates • Operating Budget	$256,547
COSMOS Revenue	Workshops, Contributions, & Indirects	$49,019
Ohio STEM Initiative	PARTNERS (Planning Grant) (5/10-11/10)	$50,000
Ohio STEM Initiative	NW Ohio STEM Consortium (Implementation Grant) (1/11-6/11)	$999,484
Ohio Board of Regents - ITQ	Partners in Inquiry Resources & Research (Project pi r^2 *two)* (1/11-5/12)	$108,030
Martha Holden Jennings Foundation	USE-IT II: Uniting Science Education, Inquiry and Technology (7/10-6/11)	$21,200
Academy of Applied Science	Ohio Junior Science & Humanities Symposium (OJSHS) (11/10-8/11)	$20,000
Perstorp Polyols	OJSHS Award Sponsor	$1,000
Libbey Glass	OJSHS T-Shirts (In-Kind Value)	$800
BG Community Foundation	STEM in the Park Sponsor	$2,500
BP-Husky, LLC	NWO Symposium Sponsor	$5,000
BP-Husky, LLC	K-12 STEM-Related Programming	$5,000
Tony Packo's	STEM in the Park (In-Kind Value)	$2,000
Square One Education Network	Professional Development & STEM in the Park Materials	$4,468
Rossford Schools	Host of monthly NWO Inquiry Series	In-Kind
Penta Career Center	Host of NWO Symposium	In-Kind
NSF - S-STEM	GRAMS: Granting Access to Mathematics and Science (5-year grant: 7/09-6/14)	$599,864
NSF - S-STEM	GRAMS II: Granting Access to Mathematics and Science (5-year grant: 7/10-6/15)	$598,693
OBOR - Choose Ohio First	BOSEF: Building Ohio's Sustainable Energy Future - BGSU portion (5-year grant: 7/09-6/14)	$987,344
Bowling Green State University	BOSEF Cost-Share (FY11)	$38,793
OBOR - Choose Ohio First	Science & Mathematics Education in Action (5-year grant: 8/08-8/13)	$3,000,000
Martha Holden Jennings Foundation	USE-IT III (7/11-6/12)	$4,000

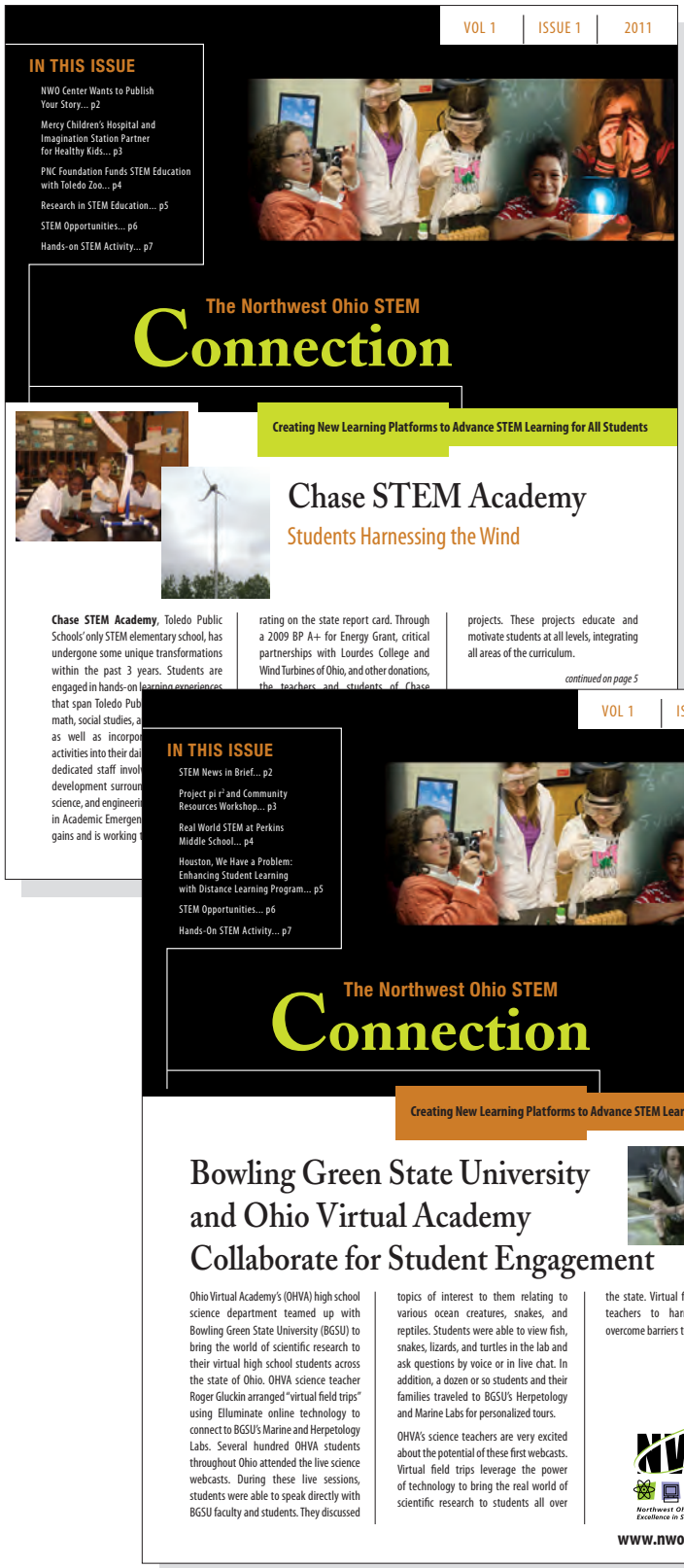
Agency - Program	Description	Award Amount
Subawards:		
Ohio Environmental Education Fund (Imagination Station subaward)	Energy Explorations (5/11-6/12)	$4,000
Toledo Community Foundation (Lucas County ESC subaward)	SPACE 2011 (11/11-9/12)	$2,138
eTech Ohio (Ohio Northern University subaward)	STeM 2 STEM (5/11-6/12)	$9,000
Martha Holden Jennings (Lucas County ESC subaward)	Tiger Team 2010 (11/10-9/11)	$2,150
ARRA Funds (WGTE subaward)	WGTE Evaluation Services (10/10-6/11)	$13,500
Affiliated Multiple-Year Grants:		
OBOR - Choose Ohio First	ACTION (5-year grant: 8/08-8/13)	$3,000,000
Grants Submitted:		
NEH (Ft Meigs subaward)	Ft. Meigs ALIVE (Denied)	$48,837
NOAA	CLIMATE*21 (2-year grant) (Denied)	$498,368
OBOR - ITQ	RISE (Denied)	$113,375
Ohio Humanities Foundation	History Lab (Denied)	$18,513
NSF - MSP/Targeted Awards	iEvolve (5 years) (Denied)	$7,692,349
TOTAL		**$6,793,520**

Appendices

A. "NWO STEM Connection" Print and E-Newsletters
B. NWO STEM Education Inquiry Series Advertising
C. NWO Symposium Advertising
D. Project pi r^2 *two* Recruitment Brochure
E. USE-IT II Recruitment Email
F. Community Resources Workshop Recruitment Email
G. STEM in the Park Advertising
H. STEM in the Park Recruitment and Fundraising Brochure
I. OJSHS Recruitment Email
J. NWO Publications and Presentations
K. Faculty and Student Recognition
L. FY 2011 NWO Evaluation Report

Appendix A: "NWO STEM Connection" Print and E-Newsletters

Print Newsletters



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IN THIS ISSUE

The Northwest Ohio STEM Connection

Creating New Learning Platforms to Advance STEM Learning for All Students

Chase STEM Academy

Students Harnessing the Wind

Chase STEM Academy, Toledo Public Schools' only STEM elementary school, has undergone some unique transformations within the past 3 years. Students are engaged in hands-on learning experiences that span Toledo Pub... math, social studies, a... as well as incorpo... activities into their dai... dedicated staff involv... development surroun... science, and engineeri... in Academic Emergen... gains and is working ... rating on the state report card. Through a 2009 BP A+ for Energy Grant, critical partnerships with Lourdes College and Wind Turbines of Ohio, and other donations, the teachers and students of Chase projects. These projects educate and motivate students at all levels, integrating all areas of the curriculum.

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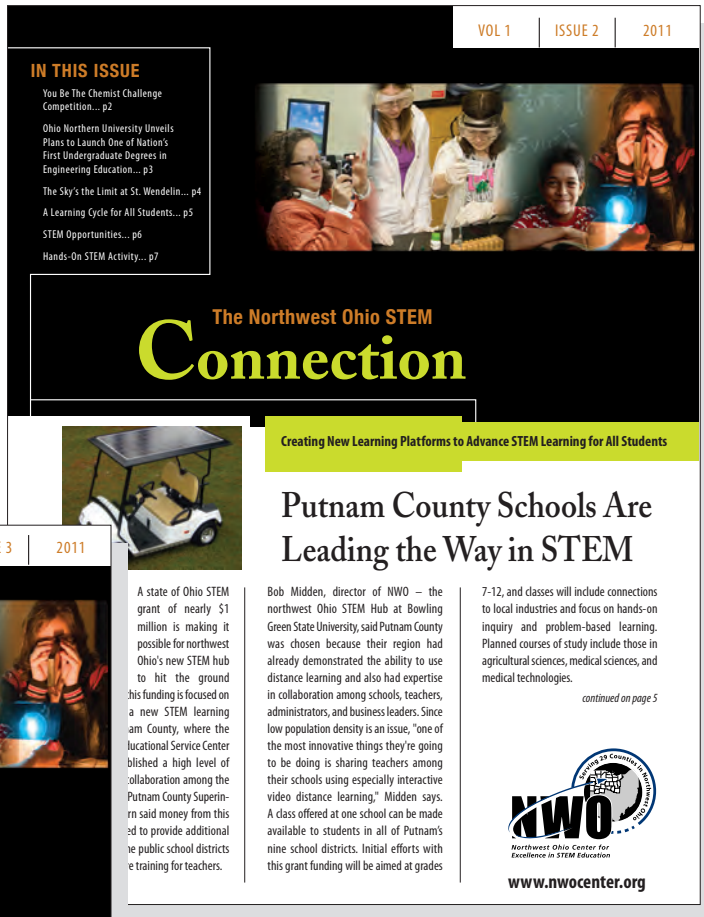

VOL 1 | ISSUE 2 | 2011

IN THIS ISSUE

The Northwest Ohio STEM Connection

Creating New Learning Platforms to Advance STEM Learning for All Students

Putnam County Schools Are Leading the Way in STEM

A state of Ohio STEM grant of nearly $1 million is making it possible for northwest Ohio's new STEM hub to hit the ground ...his funding is focused on ...a new STEM learning ...am County, where the ...ucational Service Center ...blished a high level of ...collaboration among the ...Putnam County Superin... ...rn said money from this ...ed to provide additional ...e public school districts ...e training for teachers.

Bob Midden, director of NWO – the northwest Ohio STEM Hub at Bowling Green State University, said Putnam County was chosen because their region had already demonstrated the ability to use distance learning and also had expertise in collaboration among schools, teachers, administrators, and business leaders. Since low population density is an issue, "one of the most innovative things they're going to be doing is sharing teachers among their schools using especially interactive video distance learning," Midden says. A class offered at one school can be made available to students in all of Putnam's nine school districts. Initial efforts with this grant funding will be aimed at grades 7-12, and classes will include connections to local industries and focus on hands-on inquiry and problem-based learning. Planned courses of study include those in agricultural sciences, medical sciences, and medical technologies.

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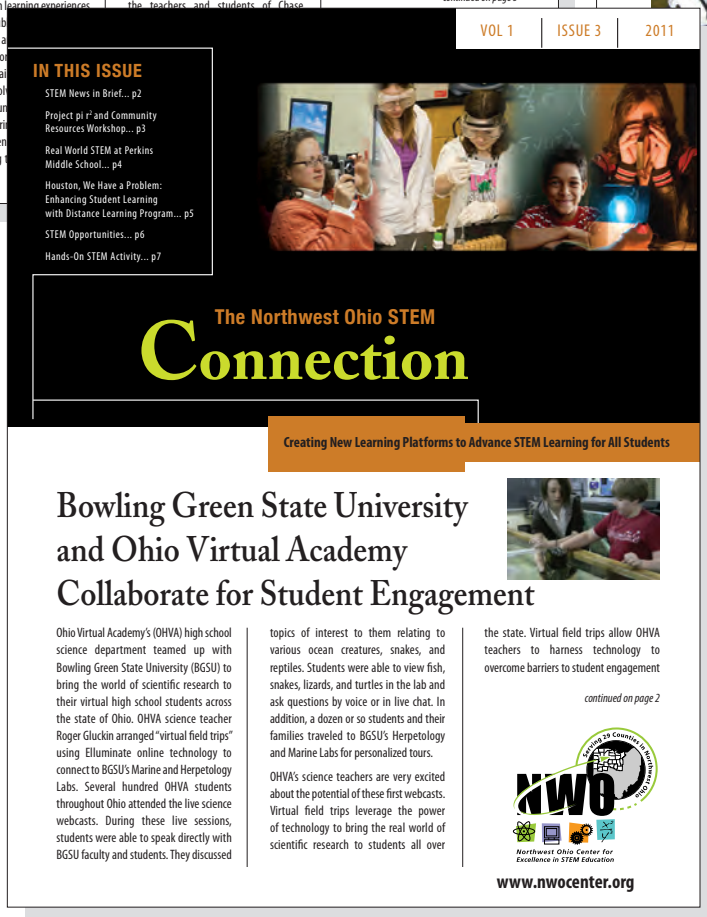
Northwest Ohio Center for Excellence in STEM Education

www.nwocenter.org



VOL 1 | ISSUE 3 | 2011

IN THIS ISSUE

The Northwest Ohio STEM Connection

Creating New Learning Platforms to Advance STEM Learning for All Students

Bowling Green State University and Ohio Virtual Academy Collaborate for Student Engagement

Ohio Virtual Academy's (OHVA) high school science department teamed up with Bowling Green State University (BGSU) to bring the world of scientific research to their virtual high school students across the state of Ohio. OHVA science teacher Roger Gluckin arranged "virtual field trips" using Elluminate online technology to connect to BGSU's Marine and Herpetology Labs. Several hundred OHVA students throughout Ohio attended the live science webcasts. During these live sessions, students were able to speak directly with BGSU faculty and students. They discussed topics of interest to them relating to various ocean creatures, snakes, and reptiles. Students were able to view fish, snakes, lizards, and turtles in the lab and ask questions by voice or in live chat. In addition, a dozen or so students and their families traveled to BGSU's Herpetology and Marine Labs for personalized tours.

OHVA's science teachers are very excited about the potential of these first webcasts. Virtual field trips leverage the power of technology to bring the real world of scientific research to students all over the state. Virtual field trips allow OHVA teachers to harness technology to overcome barriers to student engagement

continued on page 2

Northwest Ohio Center for Excellence in STEM Education

www.nwocenter.org

E-Newsletter Sample

Vol. 3 Issue #8 August 2011

In This Issue

K-16 STEM in the NEWS

Bowling Green State University and Ohio Virtual Academy Collaborate for Student Engagement

Ohio Virtual Academy's (OHVA) high school science department teamed up with Bowling Green State University (BGSU) to bring the world of scientific research to their virtual high school students across the state of Ohio. OHVA science teacher Roger Gluckin arranged "virtual field trips" using Elluminate online technology to connect to BGSU's Marine and Herpetology Labs. Several hundred OHVA students throughout Ohio attended the live science webcasts. During these live sessions, students were able to speak directly with BGSU faculty and students. They discussed topics of interest to them relating to various ocean creatures, snakes, and reptiles. Students were able to view fish, snakes, lizards, and turtles in the lab and ask questions by voice or in live chat. In addition, a dozen or so students and their families traveled to BGSU's Herpetology and Marine Labs for personalized tours. (read more)

Community STEM in the NEWS

Project pi r-squared and Community Resources Workshops

Shortly after the 2011 school year ended, 30 K-6 teachers traveled throughout Northwest Ohio experiencing STEM through baby elephants, bats, and even baseball during the first leg of a 100-hour professional development program called Project pi r-squared (Partners in Inquiry Resources and Research). The weeklong summer institute, dubbed *The Community Resources Workshop*, is an ongoing partnership among local non-profit organizations and institutions of higher education including Toledo Zoo, Toledo Mud Hens, Challenger Learning Center of Lucas County, WGTE Public Media, Lourdes College, and BGSU. The goal of the week is to introduce teachers to the myriad educational resources available to them right here in northwest Ohio. The institute also seeks to provide teachers with a sense of self and place through "teacher as student" field experiences at a variety of sites that introduce them to the rich history of innovation and invention in the Toledo area. Project pi r-squared teachers came from primarily high need schools in the region. An additional 19 teachers from area public and private schools were also permitted to join the summer institute held June 20-24, 2011. The 30 pi r-squared teachers will continue through academic year 2011-2012 with monthly professional development sessions and receive six free classroom programs provided by some of the education specialists they met during the summer institute including Toledo Botanical Garden, Imagination Station, and Sauder Village. (read more)

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STEM Opportunities

STEM in the Park

Bring your family and join NWO for three hours of hands-on STEM learning and fun September 10, 2011 from 10am to 1pm on the BGSU campus. Over 50 STEM hands-on activity stations from area colleges and universities and community organizations from PNC Bank to the Imagination Station will be featured at NWO's second annual STEM in the Park. The event (rain or shine) is free and includes free food, beverages, and take-home activities for kids of all ages. For more information, visit http://www.nwocenter.org/STEMinPark/index.htm.

Future® City Competition

In the 2011-2012 National Engineers Week Future® City Competition, sixth, seventh, and eighth graders across the country team with engineer-volunteer mentors to create their visions of the city of tomorrow. Future City combines problem-based learning with computer simulation to address real-world issues and national and state academic content standards. You can learn more and pre-register your students at www.futurecity.org; the registration deadline is October 31, 2011.

NWO Inquiry Series-PD in STEM Content

The NWO STEM Education Inquiry Series is back for the 2011-2012 school year. The series presents high quality K-12 teacher professional development in STEM content. Registration is now open for Session 1 (*Understanding the Newly Revised Standards in Math & Science* with facilitators Diane Burtchin and Michelle Shafer) to be held on September 22, 2011 from 5-8pm at Rossford High School. The $15 registration fee includes contact hours, snacks, and hands-on materials. Register online at http://www.nwocenter.org/inquiryseries/index.htm.

Workshop and Reception for Educators

The Best of the Outdoors Page: Celebrating 15 years of Nature in Northwest Ohio and Beyond with Steve Pollick and Jeff Basting

On Tuesday, September 27, 2011 from 4-7pm at Secor Metropark's National Center for Nature Photography, meet Steve Pollick, The Blade's outdoor editor, and Jeff Basting, Blade illustrator/designer, who have teamed up to bring the "best of" their nationally acclaimed, award-winning Outdoors Page to book form. Breakout sessions will help you incorporate the pages from their beautiful book into your lesson plans while meeting the revised Ohio Academic Standards. The $20 registration fee includes the Blade book, refreshments, and 3 contact hours from Bowling Green State University. For additional information, call The Blade at 419-724-6157.

New STEM Resource Center Website

NWO has recently launched an online STEM Resource Center for educators and other stakeholders interested in improving STEM education in the region.

The new resource center site at http://www.nwostemresources.org is a clearinghouse for STEM teaching and learning that provides the latest news and contact information regarding K-12 and higher education STEM programs, consultants, professional development, grants, lessons, curriculum, and informal education services to assist schools in finding high-quality, region-specific resources.

Healthy Water, Healthy People (HWHP)

Facilitator Workshop

When: Wednesday, August 24, 2011 from 9:00 a.m. - 4:00 p.m.

Where: BATTELLE DARBY CREEK Metro Park
1775 Darby Creek Drive
Galloway, OH 43119
(southwestern Franklin County)

HWHP is an innovative water quality education program sponsored by Project WET and the Hach Scientific Foundation, offering hands-on activity guides, testing kits, training, and much more. Recommended for middle and high school teachers, students, scout groups, 4-H, and home schooled groups. All activities are correlated to the National Science Standards and the Ohio Academic Content Standards for science and social studies.

For more information and to register by e-mail, please contact: Dennis Clement, Ohio EPA/OEE @ 614-644-2048 or dennis.clement@epa.state.oh.us.

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NWO Hands-On STEM Activity

Box Design Challenge

Grade Level: 5-10

Aligns to Ohio Common Core Mathematics Standards for grades 6 and 7

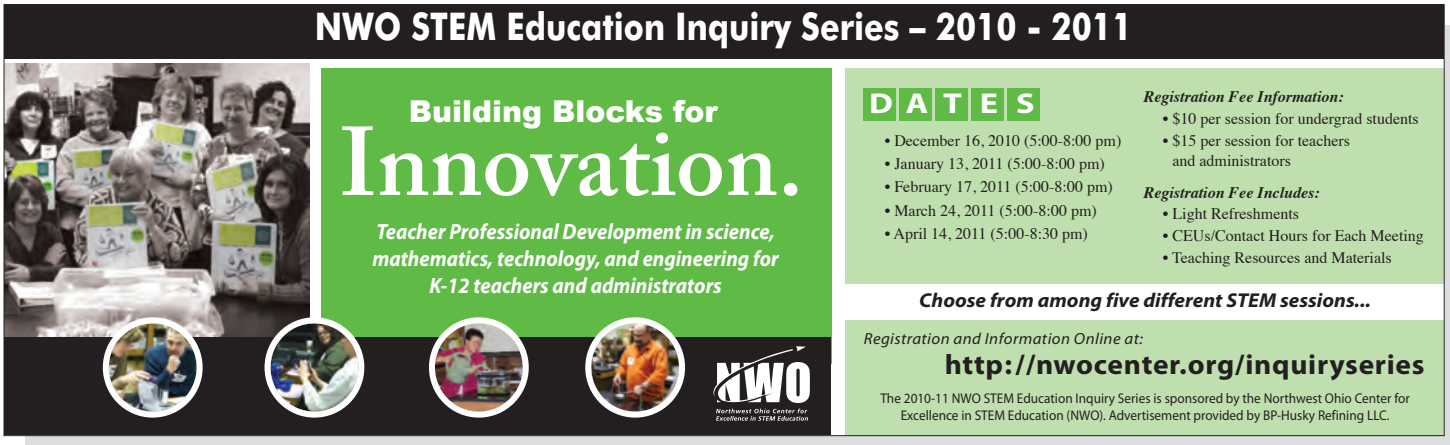
What you need:

- Examples of different shaped boxes such as Toblerone bars, Chinese food cartons, cereal boxes, unusual shaped juice cartons
- Blank sheets of construction paper or card stock
- Paper for experimenting with nets
- Protractors
- Rulers
- Pencils
- Markers
- Snack foods (enough to experiment with filling 3D boxes

Objective:
Draw and construct representations of two- and three-dimensional geometric objects using a variety of tools

Appendix B: NWO STEM Education Inquiry Series Advertising

8.5 x 11 Flyer



Newspaper Advertisment: The Blade, Toledo, OH, December 6, 2010

Appendix C: NWO Symposium Advertising

www.nwohiosymposium.org

Times have changed...

2010 NWO Symposium on Science, Mathematics, and Technology Teaching

Saturday, November 6, 2010 hosted at Penta Career Center

4 x 6 Postcard

And so has our teaching!

- Engage in innovative activities
- Share teaching ideas and tools
- Grow as an educator

Northwest Ohio's premier professional development symposium on Science, Mathematics, and Technology Teaching

Registration Fee:

– $20 for Undergraduate Students
– $40 before October 29, 2010 ($50 on-site registration)

Registration Fee Includes:

– Lunch and snacks during the day
– Certificate of contact hours
– Teaching resources and materials

NWO
Northwest Ohio Center for Excellence in STEM Education

241 Math Science Bldg., BGSU
Bowling Green, OH 43403-0212

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PERMIT #1
BOWLING GREEN OH

Register today at *(online pre-registration closes Oct. 29, on-site registration available)*
www.nwohiosymposium.org

2010 NWO Symposium

on Science, Mathematics, and Technology Teaching

Northwest Ohio Symposium on Science, Mathematics, and Technology Teaching

Times have changed...

AND SO HAS OUR TEACHING!

SAT., NOV. 6, 2010 HOSTED AT PENTA CAREER CENTER, 8:00 AM - 4:00 PM

Engage in innovative activities, share teaching ideas and tools, and grow as an educator

Registration Fee:

– $20 for Undergraduate Students
– $40 before October 29, 2010 ($50 on-site registration)

Registration Fee Includes:

– Lunch and snacks during the day
– Certificate of contact hours
– Teaching resources and materials

For more information and to Register online visit: **http://nwohiosymposium.org**

The 2010 NWO Symposium on Science, Mathematics, and Technology Teaching is sponsored by the Northwest Ohio Center for Excellence in STEM Education (NWO). Additional sponsorship provided by BP-Husky Refining LLC.

Newspaper Advertisment: The Mirror Newspaper, Maumee, OH, October, 21 2010

2010 NWO Symposium on Science, Mathematics, and Technology Teaching

SATURDAY, NOVEMBER 6, 2010 HOSTED AT PENTA CAREER CENTER
8:00 AM - 4:00 PM

Times have changed...

AND SO HAS OUR TEACHING!

Engage in innovative activities, share teaching ideas and tools, and grow as an educator

Registration Fee:

– $20 for Undergraduate Students
– $40 before October 29, 2010 ($50 on-site registration)

Registration Fee Includes:

– Lunch and snacks during the day
– Certificate of contact hours
– Teaching resources and materials

For more information and to Register online visit: **http://nwohiosymposium.org**

The 2010 NWO Symposium on Science, Mathematics, and Technology Teaching is sponsored by the Northwest Ohio Center for Excellence in STEM Education (NWO). Additional sponsorship provided by BP-Husky Refining LLC.

Northwest Ohio Symposium on Science, Mathematics, and Technology Teaching

Newspaper Advertisment: The Blade, Toledo, OH, October 4, 2010

Appendix D: Project pi r² two Recruitment Brochure

Partners in Inquiry Resources & Research

Project pi r² two

BGSU. School of Teaching and Learning

NWO Northwest Ohio Center for Excellence in STEM Education

Project pi r² *two*

Partners in Inquiry Resources and Research

What is pi r² *Two*?

Project pi r² *Two*, Partners in Inquiry Resources and Research, is an exciting free program offering 100 contact hours of high-quality, research-based teacher professional development for Ohio teachers in grades K-6 on inquiry science and STEM-related curricula. Project pi r² *Two* is a grant-funded program offering no-cost, Ohio Academi Standards-based sessions, tr outreach programs, scienc cross-curricular materials, $300 stipend to grades K-6 t who participate.

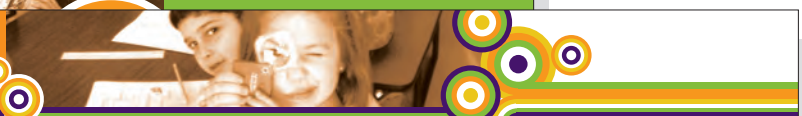
Register Today!

Online at:

www.nwocenter.org

Email, Phone, or Fax:

Michelle Klinger: mklinge@bgsu.edu
Phone: 419.372.2745
Fax: 419.372.2738



Why Project pi r² *Two*?

□ Free Community Resources Workshop

Summer Session 2011 takes you behind the scenes at some of the best community resources (Toledo Zoo, Challenger Learning Center, Toledo Museum of Art and more) in the area to explore real-world STEM and cross-curricular content and introduce teachers to STEM careers in action.

□ Academic Year Inquiry Sessions

In-depth, inquiry-based, science and cross-curricular content sessions beginning in the fall of 2011 and continuing throughout the school year. Scientists will team with our education facilitators to help teachers dispel common science misconceptions and provide new insight on how to tackle the standards that students struggle with most often. PD will include bridging with the newly revised standards.

□ Educational Outreach – Traveling Programs

The region's best educational outreach comes right to your classroom. Education specialists from the Imagination Station, Toledo Botanical Garden, Sauder Village, Toledo Area Metroparks, and others bring a variety of hands-on, inquiry-based programs to explore science with you and your students.

□ Science Experts

Scientists will visit your classroom allowing students to interact with college faculty, ask questions and learn more about STEM careers.

Professional Development

Academic Year 2011-2012

Summer 2011

- A five-day, exciting (June 20-24, 2011) Community Resources Workshop

Content Sessions – 2011-2012

- Two Saturdays (8:30 am-1:30pm – Sept. 10 and 8-4pm - Nov. 5) and seven Thursday evenings (5-8 pm) between September and April.

School Day Outreach Sessions (6)

- Outreach providers and a scientist visit your school to present one-hour classroom traveling programs to students on a variety of exciting science topics. Scheduled with teachers between October and May.
- Online Wiki sharing teacher reflections, lessons, and science content questions.

Support for the development/production of this material was provided by a grant under the federally funded Improving Teacher Quality State Grants Program, administered by the Ohio Board of Regents.

Incentives:

- **100 contact hours (10 CEUS)** from BGSU for the summer and academic year workshops
- **$300 stipend** ($150 during the academic year and $150 for the summer workshop).
- A wealth of standards-aligned, high-quality cross-curricular and classroom science materials.
- **6+ hours of free outreach programming** for your students from the Toledo Zoo, Toledo Area Metroparks, Sauder Village, and others!
- Optional BGSU graduate credit (summer and academic year – 4 hours) and Lourdes College graduate credit available (summer only – 2 hours) - at an additional cost.

Questions

Please contact:

Michelle Klinger
Asst. Director NWO and Project Manager of pi r² Two
241Math Science, BGSU
Bowling Green, OH 43403
419.372.2745
mklinge@bgsu.edu

Appendix E: USE-IT II Recruitment Email

USE-IT

Uniting Science Education, Inquiry and Technology

Attention Educators,

NWO received funding from the Martha Holden Jennings Foundation for a new cohort of USE-IT teachers for the fall 2010-spring 2011 Inquiry Series. **Space is limited to 24 teachers**. See information below to register today.

Gain strategies and classroom-ready resources that model effective applications of science instruction and 21st century skills.

Interact with new technology and/or sharpen your skills with the technology you already have.

Walk away with learning tools and free technology designed for immediate adoption into your classroom ***(all participants will receive a FLiP Digital Video Camera!)***.

Engage in best practice discussions to identify strategies that promote active, process-oriented student learning aligned to Ohio Science Standards.

Tech Spotlights will introduce you to the latest trends in educational technologies, promoting creative, cutting-edge learning activities for your classroom. This series is all hands-on so get ready to explore with technology!

WHO:
3rd-8th grade teachers who teach in an Ohio **public** school (Limit: 24 teachers)

WHEN:
Attend the following seven Thursday evening professional development events at Rossford High School (in conjunction with the NWO Inquiry Series). Contact hours (CEUs) are provided following each session. Light refreshments are provided during each session.

- September 23, 2010 - 5:00-8:30 PM
- October 21, 2010 - 5:00-8:00 PM
- December 16, 2010 - 5-:00-8:00 PM
- January 13, 2011 - 5:00-8:00 PM
- February 17, 2011 - 5:00-8:00 PM
- March 24, 2011 - 5:00-8:00 PM
- April 14, 2011 - 5:00-8:30 PM

*Attend the NWO Symposium on Saturday, November 6, 2010 at Penta Career Center from 8am -4pm for an additional eight contact hours. For more information visit: http://www.nwohiosymposium.org.

If you are interested in the USE-IT program and would like to register for this professional development program, please email Michelle Leow Klinger at mklinge@bgsu.edu or Annie Adams at aadams@bgsu.edu with the following information:

- First and Last Name
- Email Address
- Phone Number (both home and school)
- School Name
- School District
- School Address, City, and Zip
- Subject(s) you currently teach
- Grade(s) you currently teach

Participants in the USE-IT program will be asked to cover the registration fee of $15 per session for six sessions of the Inquiry Series. All participants will receive technology (including a *FLIP* video camera) and teaching materials paid for by the grant for taking part in this program. Staff Development Funds, Title I Part A or Title III and School Improvement Funds may be used to cover this registration fee. Purchase orders and checks are accepted - ask your school for details and this year we also have an online credit card payment option.

For more information on the USE-IT program, check out the website here.

NWO
241 Math/Sci Bldg.
Bowling Green, Ohio 43403
BGSU
419-372-2718
nwocenter.org

Appendix F: Community Resources Workshop Recruitment Email

Mark Your Calendar for
An A+ Resource for Teachers

2010 Community Resources Workshop for Educators

June 14-18, 2010

A HIGH-QUALITY PROFESSIONAL DEVELOPMENT PROGRAM THAT INCLUDES:

- Five fast-paced days*
- Tips for energizing your lesson plans
- Free flashdrive, Spangler Science Kit and tote bag
- Free breakfast, lunch and snacks included
- A wealth of materials, services and resources available through your community's resources
- Standards-aligned connections to your curriculum
- **35 contact hours from BGSU** or **2 semester graduate credits** through Lourdes College at discounted rates
- Raffle prizes and more

This year's workshop will focus on ***21st Century Skills***. Learn unique and exciting ways to increase student critical thinking and problem solving skills using inquiry-based, cross-disciplinary approaches to teaching

** Workshop requires daily walking tours and outdoor activities.*

Presented by The Community Resource Partners of Northwest Ohio in conjunction with a Regional Partner Project Grant from NWO at BGSU.

SESSIONS WITH AREA EDUCATIONAL SPECIALISTS AND FIELD TRIPS TO:

The Blade, Challenger Learning Center of Lucas County, Franciscan Center and Life Lab of Lourdes College, Metroparks of the Toledo Area, Imagination Station, Toledo-Lucas County Public Library, Toledo Mud Hens, Toledo Museum of Art, Toledo Zoo, & WGTE Public Media.

Plus presentations by additional local organizations.

For more information or to register, contact:

The Toledo Museum of Art at 419.255.8000 ext. 7266
or visit https://sites.google.com/site/communityresourcesworkshop/

The cost for this workshop is $140 and includes two meals per day and snacks, entrance fees into all venues and some parking fees. Each teacher will receive a science kit, flashdrive and tote bag plus loads of classroom resources. Lourdes College credit is deeply discounted to provide an outstanding, one-of-a-kind professional development experience along with two graduate credit hours.
PLEASE NOTE: TITLE I PART A FUNDS OR TITLE III FUNDS CAN BE USED TOWARD THIS WORKSHOP.

Appendix G: STEM in the Park Advertising

8.5 x 11 Flyer
11 x 17 Poster
4 x 6 Postcard

Newspaper Advertisments: The Mirror Newspaper, Maumee, OH, August 2010
The Blade, Toledo, OH, August 2010
Sentinel-Tribune, Bowling Green, OH, August 2010
Maumee Indoor Theater, Maumee, OH, August 2010

Appendix H: STEM in the Park Recruitment and Fundraising Brochure

Did you know that 75% of Nobel Prize winners in the sciences report that their passion for science was first sparked in non-school environments?

At NWO our mission is advancing STEM education for people of all ages. We can accomplish this by encouraging everyone from very young children to senior citizens to see the Science, Technology, Engineering, and Mathematics happening all around them. NWO's **STEM in the Park** event invites families to explore these subjects through free hands-on, inquiry-based STEM activities provided by a community of teachers and learners from faculty scientists to business professionals from informal educators to undergraduate and even K-12 students. By offering a community day for fathers, mothers, grandparents and children to enjoy STEM, **STEM in the Park** not only provides a valuable learning experience but also an extraordinary way to spend family time together.

Dr. W. Robert Midden
Director, NWO

Highlights of 2010 STEM in the Park

- Opportunities to meet and engage with scientists, engineers, mathematicians, educators and experts in STEM fields.
- Free hands-on, inquiry-based STEM activities.
- Free take-home **STEM Activity Cards** and materials.
- Free food catered by Tony Packo's.

We were really impressed with this event! It was well organized, engaging, and so great for kids! My kids had a great time learning new science and math concepts - what more could a parent ask for?!

- Ottawa Hills, Ohio

I would really like to thank all the workers and volunteers for making such a great impression on my husband and I and my boys. We also were so impressed with all the activities and fun simple things that got my kids interested in STEM. I really hope you will continue to have this event every year. Thank you very much for a great Saturday!!!!

- Delta, Ohio

STEM in the PARK

Science, Technology, Engineering, and Mathematics

Families Learning Together

Thank you for a wonderful family experience! My kids and I already love STEM...and this lived up to our expectations and more!

- Grand Rapids, Ohio

STEM in the Park?

(Science, Technology, Engineering, and Mathematics)

The first annual NWO **STEM in the Park** community event in Bowling Green, OH was a great success. The event drew over 1,600 people on Saturday, September 11, 2010 to the campus of Bowling Green State University for three hours of hands-on, minds-on science activities.

Raising STEM Community Awareness

By increasing awareness in STEM (Science, Technology, Engineering, and Mathematics) facilities, programs and activities in the area, **STEM in the Park** is an opportunity for businesses, universities, K-12 schools and non-profit organizations to showcase innovation, educational opportunities, and careers and to promote positive attitudes toward STEM teaching and learning.

Over 40 exhibitors were involved in **STEM in the Park** including Toledo Zoo, Fort Meigs, Starks, Inc. - Green By Design, Liberty Center Schools, WGTE Public Media and BGSU's Colleges of Education and Human Development, Arts & Sciences and Technology.

Sponsors for the event included BP-Husky, LLC, Square One Education Network, Coca-Cola, Tony Packo's, Bowling Green Community Foundation and BGSU.

Family Hands-On Learning

STEM Activity Stations

More than 50 community partners including museums, universities, K-12 schools and businesses developed **STEM in the Park Activity Stations** for families to build, experiment, and create using hands-on materials. These Activity Stations included Challenger Learning Center of Lucas County, Imagination Station, Grand Rapids Elementary School, BGSU's School of Teaching and Learning, Ohio Northern University's Engineering Department and University of Toledo's Chemistry Department.

Families joined in activities like petting live starfish, making ice cream, setting off rockets, extracting their own DNA and standing inside giant bubbles.

Take-Home Activity Cards

Many **Activity Stations** featured **Take-Home Activity Cards** for families to continue hands-on learning long after the event concluded.

Amazing Animal Adaptations, Everlasting Bubbles, Film Canister Rockets, and Tangram Animals were just some of the **Take-Home Family Activities** available from BGSU's Physics Department, Toledo Museum of Art and others.

"Flightastic" Science Event

Children were given a Bernoulli Wind Bag to participate with their parents in an event-wide science experiment for all!

STEM in the Park FAQ*

Q: How engaging is STEM in the Park for children and adults?

A: **STEM in the Park** is very engaging for people of all ages! The exhibitors at **STEM in the Park** reported that 89% of children and 67% of adults were substantially engaged at their activity tables. One exhibitor said:

> *"Adults were as interested and interacted as much as the children ... They enjoyed sharing in the activity, exchanging information and ideas, and extending the learning experience for their children."*

Also, 95% of attendees reported that their children were moderately or substantially engaged during STEM in the Park. One parent said:

> *"My daughter was completely engaged and excited the entire time. She can be a tough critic, so that was VERY impressive!" – Maumee, Ohio*

Q: Can STEM in the Park increase children's interest in STEM?

A: Definitely! In fact, 87% of attendees reported that their children were more interested in STEM after coming to STEM in the Park. Also, after leaving the event, many attendees did some of the ...take-home activities that were given out at several of the activity tables. One parent said:

> *"My 4 and 7 year old girls were fully engaged, loved every activity, and we did science activities for the remainder of the day as a result. They are still flying their airplanes, and we are making preparations to make baking soda rockets later this week." – Toledo, Ohio*

* From NWO evaluation of STEM in the Park

Appendix I: OJSHS Email

Call for High School Research Papers and Posters

Sponsored by the Northwest Ohio Center for Excellence in STEM Education (NWO) and The School of Teaching and Learning at Bowling Green State University.

In cooperation with The Academy of Applied Science and with the support of the Departments of the Army, Navy, and Air Force.

Important Deadline ~ February 18, 2011

- Online registration is required for all participants including Paper Presenters, Poster Presenters, Teachers, Student Delegates.
- Registration fee: $25 per student
- **Poster Presenters** must submit an **Abstract during the registration process.**
- **Paper Presenters** must submit an **Abstract** and a copy of the **Research Paper during the registration process.**

imagine.design.create

Visit our web site for more information
www.ojshs.org

The National Association of Secondary School Principals has placed this program on the NASSP National Advisory List of Student Contests and Activities for 2010-2011

Appendix J: NWO Publications and Presentations

Faculty Refereed Publications

Burgoon, J. N., & **Duran, E.** (in press). Investigating elementary teachers' conceptions of animal classification. *School Science and Mathematics*.

Burgoon, J. N., Heddle, M. L., & **Duran, E.** (2010). Re-examining the similarities between teacher and student conceptions about physical science. *Journal of Science Teacher Education, 21*(7), 859-872.

Dimling, L. M., **Worch, E. A.**, Murray, M. M., Oldrieve, R., Peet, S., Viramontez Anguilano, R., Straka, L., & Wooldridge, D. G. (2011). Practices and partnerships in preschool literacy. *Delta Kappa Gamma Bulletin: International Journal for Professional Educators*, 77(2), 71-79.

Duran, E., **Ballone Duran, L.**, & **Haney, J. J.** (2010). Project ASTER III: A model for teacher professional development integrating science museum exhibits with state and national science education content standards. Curator: *The Museum Journal, 53*(4), 437-449.

Duran, E., **Ballone Duran, L.**, & **Haney, J. J.**, & Scheuermann, A. (2011, March). A learning cycle for all students: Modifying the 5E instructional model to address the needs of all learners. *The Science Teacher*, pp. 56-60.

Lumpe, A. T., Czerniak, C. M., **Haney, J. J.**, & Beltyukova, S. (in press). Beliefs about teaching science: The relationship between elementary teachers' professional development and student achievement. *International Journal of Science Education*.

Messersmith, S. J., Kirschbaum, K., & Kirchhoff, J. R. (2010). Luminescent low-valent rhenium complexes with 1,2-bis (dialkylphosphino) ethane ligands: Synthesis and x-ray crystallographic, electrochemical characterization, and spectroscopic characterization. *Inorganic Chemistry*, 49, 3857-3865.

Oldrieve, R., Dimling, L. M., **Worch, E. A.**, Peet, S., Murray, M. M., Viramontez-Anguiano, R., & Straka, L. (2010). Early literacy development: An exploratory study of beliefs and practices in pre-kindergarten programs. *Ohio ASCD Journal, 13*(2), 22-27.

Partin, M. L., & **Haney, J. J.** (2011, January 25). The CLEM model: Path analysis of the mediating effects of attitudes and motivational beliefs on the relationship between perceived learning environment and course performance in an undergraduate non-major biology course. *Learning Environments Research*.

Partin, M. L., **Haney, J. J.**, **Worch, E. A.**, **Underwood, E.**, Nurnberger-Haag, J., Scheuermann, A., & **Midden, W. R.** (2011). Yes I can: The contributions of motivation and attitudes on course performance among biology non-majors. *Journal of College Science Teaching, 40*(6).

Partin, M. L., & **Worch, E. A.** (in press). The virtual tour and implications for synchronous distance education. *International Journal of Instructional Media*.

Worch, E. A. (2010). Play behaviour in red colobus monkeys in Kibale National Park, Uganda. *Folia Primatologica, 81*, 163-176.

Worch, E. A., & **Haney, J. J.** (n.d.). Nature's Neighborhood: A children's zoo designed to promote science learning through active play. *Children, Youth and Environments*. Manuscript submitted for publication.

Worch, E. A., Li, L., & **Herman, T. L.** (n.d.). Preservice early childhood teachers' self-efficacy and outcome expectancy for ICT integration in science instruction. *Education Research and Perspectives*. Manuscript submitted for publication

Presentations

Kumar, R., Seay, N., **Burgoon, J.**, & Karabenick, S. A. (2011, April). *Mastery and performance-focused instructional practices: Teachers' cultural frames of reference and cultural responsibility*. Paper presented at the American Educational Research Association (AERA) Conference, New Orleans, LA.

Worch, E. A. (2011, March). *Nature's Neighborhood: A play-based children's zoo that promotes science learning and appreciation of nature*. Paper presented at the annual meeting of the National Science Teachers Association, San Francisco, CA.

Worch, E. A., & **Haney, J. J.** (2011, April). *Behavior mapping: Assessing play and science learning at Toledo Zoo's Nature's Neighborhood*. Paper presented at the Association for the Study of Play International Conference, Rochester, NY.

Appendix K: Faculty & Student Recognition

BGSU

Zoom news

BOWLING GREEN STATE UNIVERSITY NEWS UPDATE

Thursday, April 7, 2011

Meel named distinguished teacher of mathematics

David Meel (left) receives the 2011 Award for Distinguished College or University Teaching of Mathematics from 2010 winner Dick Little of Baldwin-Wallace College.

Dr. David Meel's longtime commitment to helping students master and teach mathematics, along with his contributions to the profession, were recognized last month by the Ohio Section of the Mathematical Association of America. The organization presented him the Award for Distinguished College or University Teaching of Mathematics.

Meel has been teaching math full time at BGSU since 1996 and has twice received the Kappa Mu Epsilon (mathematics honorary) Excellence in Teaching Mathematics Award at the University.

He is active in creating and employing teaching innovations such as interactive applets for linear algebra and calculus. He has used quilt pattern construction in teaching prospective teachers, as part of mathematics in art, and has published on the topic. He has also written on the use of story telling and writing in teaching math.

Meel is dedicated to preparing graduate students to teach math, and has developed and taught numerous courses, including online courses for in-service teachers.

When he heard of Meel's nomination for the award, a former student sent an unsolicited e-mail, writing, "He was an amazing professor. He helped me in more than just understanding the history of math, or how to approach teaching students. He also helped me to find my passion for teaching math. During his class I began to question my potential as a math teacher and if I would ever learn all that I needed to know. Dr. Meel sat me down in his office and helped to realize that I am not supposed to be perfect at everything as a new teacher; much like my students, I will learn too. BGSU is very lucky to have him as a part of the math and education program because he has impacted countless students' learning."

BGSU in the news

NFL experts come to BGSU
- WUPW, Sentinel-Tribune

Inside The Oaks dining hall
- WUPW, Sentinel-Tribune, WTVG

Jackson comments on possible government shutdown
- WUPW, WTVG

A show of creativity at VCTO exhibit
- Sandusky Register

'Bunnicula the Musical' stalks university stage
- Sentinel-Tribune

BGSU alumna, author visits campus
- Sentinel-Tribune

Tent city to raise homelessness awareness
- Sentinel-Tribune

ODK leadership honorary inducts new members

The 2011 inductees of the BGSU Circle of Omicron Delta Kappa

The BGSU circle of Omicron Delta Kappa welcomed five faculty and staff members and 21 students into the organization at an induction ceremony April 1 in Prout Chapel.

One of the nation's oldest and most prestigious leadership honor societies, ODK was founded in 1914 at Washington and Lee University in Lexington, Va. It was the first college honor society to have a national scope and honor students for meritorious leadership and service in extracurricular activities. Bowling Green's chapter, or circle, was created in 1949 and since then has initiated more than 1,700 students, faculty, staff and alumni.

Faculty and staff members inducted were:

BGSU

Zoom news

BOWLING GREEN STATE UNIVERSITY DAILY NEWS UPDATE

Monday, January 10, 2011

Duran wins faculty award for science education work

Dr. Emilio Duran

According to Dr. Emilio Duran, "My ultimate goal is to advance science education for people of all ages by increasing science understanding and to stimulate the interest of young people in science."

For his achievements, the College of Education and Human Development has presented him the 2010 EDHD Faculty Scholarship Award. Given every three years, the award recognizes outstanding contributions of a faculty member in the college.

Duran has a joint appointment in the School of Teaching and Learning and the biological sciences department. His nominator wrote that the interdisciplinary nature of his research has allowed Duran to "successfully and seamlessly bridge teaching, scholarly and service activities."

His scholarship focus has shifted from basic research in molecular biology at the University of Toledo to applied research in science education at BGSU in the areas of improving K-12 and college science teaching through professional and pre-service development; examining factors that influence teachers' beliefs and perceptions in science teaching and learning, and developing professional programs to identify and correct teacher misconceptions about science concepts and analyzing the impact of these misconceptions on student learning.

Since arriving at BGSU in 2007, Duran's scholarly achievements have been noteworthy. He has published 10 refereed journal articles that focus on teachers' scientific knowledge and professional development and has presented at numerous national and international conferences. In addition, he has received 10 grants and external awards worth over $2 million.

He came to BGSU to join an established group of STEM professionals from the colleges of Arts and Sciences, Education, and Technology. The group has proposed a new model of science instruction designed to address the learning needs of all students, and is now testing and collecting data on the model. They are poised to lead a new area of differentiated instruction in science education at the national level, Duran said.

BGSU in the news

Familiar face: Lt. David Weekley
- Sentinel-Tribune

Alumna Becky Minger in Las Vegas for Miss America pageant
- Sentinel-Tribune

Skaggs comments on shipwreck discovered off Rhode Island
- Associated Press

Zoom, Monitor change publication dates

Welcome back to a new semester! As previously announced, Zoom will now be on a new schedule, appearing Mondays and Thursdays in a new format. It will include some of the items previously published in Monitor, such as job postings, obituaries and the weekly calendar for faculty and staff.

A streamlined Monitor will be published the last Tuesday of each month.

Please keep us posted with news from your offices and divisions. We are eager to share stories about faculty, staff and students, as well as important University initiatives and policy news.

Contact Bonnie Blankinship at bblanki@bgsu.edu or 2-2618, or Jennifer Sobolewski at jsobole@bgsu.edu or 2-8582.

Cheer for our cheerleaders

The BGSU cheerleading team performs at the women's basketball game on Jan. 8. Ranked third in the nation, they and the dance team are practicing intensively to compete in the United Cheerleading Assoc. National Competition in Orlando, Fla., on Jan. 15. ESPN will broadcast the event in March—be sure to tune in as we cheer for our team.

Duran wins faculty award for science education work

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For his achievements, the College of Education and Human Development has presented him the 2010 EDHD Faculty Scholarship Award. Given every three years, the award recognizes outstanding contributions of a faculty member in the college.

Duran's focus has shifted from basic research in molecular biology to applied research in science education. Areas include improving K-12 and college science teaching through professional and pre-service development and examining factors that influence teachers' beliefs and perceptions in science teaching and learning. In addition, Duran is developing professional programs to identify and correct teacher misconceptions about scientific concepts, and analyzing the impact of these misconceptions on student learning.

He came to BGSU to join an established group of science, technology, engineering and mathematics professionals from the colleges of Arts and Sciences, Education and Human Development, and Technology. The group has proposed a new model of science instruction designed to address the learning needs of all students, and is now testing and collecting data on the model. They are poised to lead a new area of differentiated instruction in science education at the national level, Duran said.

Appendix L: FY 2011 NWO Evaluation Report

Northwest Ohio Center for Excellence in STEM Education

2011 Evaluation Report

Prepared by

Jacob Burgoon, NWO Project Evaluator

August 2011

Table of Contents

List of Tables and Figures

Executive Summary

The Northwest Ohio Center for Excellence in STEM Education (NWO) coordinated and implemented several activities and projects during the 2011 fiscal year. The purpose of this report is to describe the evaluation findings regarding those activities and projects, and measure the extent to which NWO attained the following goals:

1. Develop the expertise of pre-service and in-service teachers in STEM and STEM education disciplines.
2. Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.
3. Conduct and communicate collaborative research in STEM and STEM education disciplines.
4. Develop and sustain a regional collaborative alliance including university, school, informal education, and business partners through a shared vision and collaborative spirit for tackling current STEM education issues.
5. Support higher education faculty and future faculty in pursuit of the best practices in STEM and STEM education disciplines to enhance undergraduate and graduate education.

Online surveys were the primary data collection method used for the evaluation of the NWO activities and project, but observations and document analyses were also used. For most of the NWO goals, data were collected to answer multiple evaluation questions. The evaluation findings for each goal are summarized below.

NWO Goal 1. Data were collected and analyzed in order to evaluate the NWO Inquiry Series, NWO Symposium, Community Resources Workshop, and USE-IT project. Specifically, the data were used to measure participants' perceptions of the NWO activities and projects, and the impact of the activities and projects on participants. The evaluation findings indicate that teachers had positive perceptions regarding the NWO Inquiry Series, NWO Symposium, Community Resources Workshop, and the USE-IT project. The teachers' written comments on the evaluation surveys suggested that teachers intended to use the knowledge and resources

gained from the NWO activities and projects in their classroom. Furthermore, teachers improved their attitudes about STEM and STEM education as a result of participating in the NWO activities and projects.

NWO Goal 2. Data were collected and analyzed in order to evaluate the Ohio Junior Science and Humanities Symposium (OJSHS) and STEM in the Park. Specifically, the data were used to measure the participants' perceptions of the NWO activities and the extent to which the activities attracted and sustained interest in STEM. The findings indicate that participants perceived the NWO activities to be valuable, engaging, and influential in the improvement and sustainability of students' interest in STEM.

NWO Goal 3. Data were collected and analyzed in order to evaluate the Faculty Research Learning Community. Specifically, the data were used to measure the participants' perceptions of the NWO activity, and the nature of participants' contribution to STEM teaching and learning research. The findings indicate that the participants in the learning community perceived it to be valuable and well organized. Furthermore, as a result of the learning community, many of the participants developed, conducted, and communicated research studies regarding STEM teaching and learning.

NWO Goal 4. The NWO projects and activities were analyzed in order to determine the extent to which they developed and sustained regional partnerships, and the nature of those partnerships. Almost all NWO activities and projects were founded upon long-standing relationships between NWO and its partners. As such, the implementation of these activities and projects successfully sustained and developed existing regional partnerships with multiple colleges and departments at Bowling Green State University, K-12 schools, educational service centers, community organizations, and businesses. In addition, new partnerships were formed across northwest Ohio, due largely to the funding of the NWO STEM Consortium in January of 2011. The NWO partnerships were collaborative in nature, with NWO both providing and receiving assistance in various forms from its partners throughout northwest Ohio.

NWO Goal 5. Data were collected from the participants of the Faculty Research Learning Community in order to determine impact of the research community on participants' STEM research and teaching practices. The evaluation findings indicate that the learning community resulted in the implementation of new pedagogies and learning strategies, and that

the learning community successfully facilitated the development of collaborative research projects.

Overall, the evaluation findings suggest that NWO successfully attained its goals. And in addition to providing evidence for the attainment of goals, the evaluation findings were also used to identify ways in which NWO activities and projects could be improved. The participants' comments and suggestions, in conjunction with other evaluation data, were used to develop several recommendations regarding the future implementation of STEM in the Park, USE-IT, the NWO Symposium, OJSHS, and the Community Resources Workshop.

Introduction

This report will describe the evaluation findings regarding the activities and grant projects implemented by the Northwest Ohio Center for Excellence in STEM Education (NWO) during the 2011 fiscal year (July 2010 – June 2011). The report will begin with an overview of the evaluation design, including a description of the methods used for data collection. The report will continue with a presentation of the evaluation findings and conclusions, and will end with several recommendations regarding the NWO activities and projects.

This report will present evaluation findings for the following activities and projects that were coordinated and implemented by NWO during the 2011 fiscal year:

- STEM in the Park (September 2010) *
- NWO Inquiry Series (September 2010 – April 2011)
- USE-IT (September 2010 – April 2011) *
- Faculty Research Learning Community (September 2010 – April 2011)
- NWO Symposium (November 2010) *
- NWO Consortium Activities (January 2011 – June 2011) *
- Ohio Junior Science and Humanities Symposium (March 2011) *
- Community Resource Workshop (June 2011) *

Independent evaluation reports were written for the NWO activities and projects that are followed by an asterisk. The evaluation reports contain a more detailed account regarding the evaluation of the activities and projects than what is included in this report, including full versions of the evaluation instruments. The evaluation reports can be found at www.nwocenter.org/reports.

NWO Evaluation

The NWO evaluation activities were generally designed to measure the extent to which NWO attained the following goals:

1. Develop the expertise of pre-service and in-service teachers in STEM and STEM education disciplines.
2. Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.
3. Conduct and communicate collaborative research in STEM and STEM education disciplines.
4. Develop and sustain a regional collaborative alliance including university, school, informal education, and business partners through a shared vision and collaborative spirit for tackling current STEM education issues.
5. Support higher education faculty and future faculty in pursuit of the best practices in STEM and STEM education disciplines to enhance undergraduate and graduate education.

More specifically, the purposes of the NWO evaluation were to 1) assess the quality of NWO activities and projects; 2) measure the impact of NWO activities and projects on educators, students, members of the community, and NWO business and community partners; 3) identify the strengths and weaknesses of NWO activities and projects; and 4) provide recommendations regarding the implementation of future NWO activities and projects.

Each of the NWO activities and projects were aligned with one or more of the above NWO goals. In order to measure the extent to which NWO attained its goals, one or more evaluation questions were formulated for each goal, and the evaluation findings from each activity and project were used to answer the evaluation question(s). Online surveys were the primary data collection method used for this evaluation, but observations and document analyses were also used. Table 1 demonstrates the alignment between NWO goals, activities/projects, evaluation questions, and data collection methods.

Table 1. Alignment of NWO goals, activities, evaluation questions, and data sources

NWO Goal	NWO Activities and Projects	Evaluation Questions	Data Collection Methods
1. Develop the expertise of pre-service and in-service teachers in STEM and STEM education disciplines.	• NWO Inquiry Series • NWO Symposium • Community Resource Workshop • USE-IT	• What are the participants' perceptions of NWO activities and projects? • What is the impact of NWO activities and projects on participants?	• Online surveys • Observations
2. Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.	• Ohio Junior Science and Humanities Symposium (OJSHS) • STEM in the Park	• What are the participants' perceptions of NWO activities and projects? • To what extent do NWO activities and projects attract and sustain interest in STEM?	• Online surveys
3. Conduct and communicate collaborative research in STEM and STEM education disciplines.	• Faculty Research Learning Community	• What are the participants' perceptions of the research community? • What is the nature of participants' contribution to STEM teaching and learning research?	• Online survey • Document Analysis
4. Develop and sustain a regional collaborative alliance including university, school, informal education, and business partners through a shared vision and collaborative spirit for tackling current STEM education issues.	• NWO Collaborative Council • STEM in the Park • Community Resource Workshop • NWO STEM Consortium Activities	• To what extent do NWO activities and projects develop and sustain regional partnerships, and what is the nature of those partnerships?	• Document Analysis • Online surveys
5. Support higher education faculty and future faculty in pursuit of the best practices in STEM and STEM education disciplines to enhance undergraduate and graduate education.	• Faculty Research Learning Community	• What is the impact of the research community on participants' STEM research and teaching practices?	• Online survey

Data Collection Methods

This section will describe the methods that were used to collect data from the NWO participants during the 2011 fiscal year.

NWO Inquiry Series Evaluation Survey

The Inquiry Series Evaluation Survey consists of several demographic items (e.g., grade levels taught, number of years teaching) and several items that measure teachers' perceived value of the Inquiry Series session they attended. The items are measured on a four-point scale, with 1 = Disagree, 2 = Somewhat Disagree, 3 = Somewhat Agree, and 4 = Agree. Some examples of the items include, "The session was engaging," and "The content/information presented during the session was valuable to me". The survey was administered online after the completion each monthly Inquiry Series professional development session. The average monthly response rate was 83%.

NWO Symposium Evaluation Surveys

The NWO Symposium was evaluated using three surveys: the session evaluation survey, the attendee evaluation survey, and the presenter and vendor evaluation survey. The session evaluation survey consisted of the following statements, to which to the participants rated their level of agreement on a four-point scale (1=Disagree, 2=Somewhat Disagree, 3=Somewhat Agree, 4=Agree):

1. The session was engaging.
2. The information presented during the session was valuable.
3. I learned something new from the session.
4. The educational community would benefit from knowing the information presented during the session.
5. The session was easy to follow and well organized.

The session evaluation survey also provided participants an opportunity to offer comments about the session and/or presenter. The prompt on the survey read, "Please use the box below to tell us about your perceptions of the session in your own words. You can include comments (good or bad) about the session, as well as your perceptions about the value and applicability of the information presented during the session". The attendees were asked to complete one survey for each session they attended. Eight surveys – one for each session – were

provided to the attendees in an envelope at registration. Attendees were asked to complete the surveys, put them back in the envelope, and return the envelope at the end of the day.

The attendee evaluation survey was an online survey that consisted of 21 items regarding the attendees' demographic information (e.g., professional status, teaching information) and perceptions regarding the NWO Symposium. The perception items were primarily about the sessions, but also asked about the vendors, venue, food, and program book. The section regarding the attendees' perceptions of the Symposium sessions included five items measured on a four-point Likert scale with 1=Disagree, 2=Somewhat Disagree, 3=Somewhat Agree, and 4=Agree. Sample items include, "The sessions I attended were engaging" and "I will incorporate the information/resources from the Symposium into my professional practices (e.g., teaching, administration, etc.)". The items regarding the attendees' perceptions of the vendors, food, program book and venue were measured on a four-point Likert scale with 1=Poor, 2=Average, 3=Good, and 4=Excellent. The survey also included several open-ended items to solicit attendees' comments and suggestions about the NWO Symposium. The link to the attendee evaluation survey was included in an e-mail sent to the attendees following the NWO Symposium. Reminder e-mails were sent to the attendees who did not complete the survey after one and two weeks. The overall response rate for the attendee evaluation survey was 69%.

The presenter and vendor evaluation survey was an online survey that consisted of 14 to 18 items (depending on the whether the respondent was a presenter, vendor, or both) regarding the presenters' and vendors' perceptions about the success of the NWO Symposium, and the overall quality of the NWO Symposium. The items regarding the participants' perceptions were mostly open-ended. The items regarding the overall quality of the NWO Symposium were measured on a four-point Likert scale with 1=Poor, 2=Average, 3=Good, 4=Excellent. The survey also included several open-ended items to solicit the presenters' and vendors' comments and suggestions about the NWO Symposium. The link to the presenter and vendor survey was included in an e-mail that was sent to the presenters and vendors following the NWO Symposium. Reminder e-mails were sent to those who did not complete the survey after one and two weeks. The overall response rate for the presenter and vendor survey was 61%.

OJSHS Evaluation Survey

The OJSHS evaluation survey included several items that asked participants to rate the quality of several aspects of the 2011 OJSHS, including the keynote presentation, the poster and paper judges, the organization of poster presentation space, and the awards ceremony. The survey also asked participating students to rate how effective the OJSHS was at increasing their interest in STEM research and careers. The survey included several closed-ended multiple-choice items (nine for students and four for non-students) and several open-ended items (three for students and four for non-students) that asked participants to write about their perceptions of the 2011 OJSHS and give suggestions regarding how it could be improved. A link to the online survey was included in the participants' registration packet. The link was also e-mailed to the participants one week after the end of the event. The response rate was 68% for the student participants and 34% for the non-student participants.

STEM in the Park Evaluation Surveys

STEM in the Park was evaluated with two online surveys. The Public Perceptions of STEM in the Park survey included several questions regarding the attendees' perceptions of the event. An e-mail containing a link to the online survey was sent to the 344 adult attendees who provided an e-mail address when registering for STEM in the Park. As an incentive for completing the survey, attendees were entered into a raffle to win a one-year membership to the Imagination Station, Sauder Village, or the Toledo Zoo. A total of 171 responses were collected for the attendee survey, resulting in a response rate of 49.7%.

The Exhibitor Perceptions of STEM in the Park survey included several questions regarding the exhibitors' perceptions of the event, including their perceptions of the attendees' (both children and adult) engagement in the event activities. An e-mail containing a link to the online survey was sent to 53 exhibitors the week following the event. A total of 26 responses were collected for the exhibitor survey, resulting in a response rate of 49.1%.

Community Resources Workshop Evaluation Survey

The Community Resources Workshop Evaluation Survey consists of 15 items that measure teachers' perceptions of the quality of the workshop as well as the impact the workshop had on the teachers' awareness of and attitudes toward community resources. The impact questions

asked teachers to rate their opinions twice: once to represent their opinion at the end of the CRW and another to represent their opinion as it was before the CRW, resulting in a measure of self-reported change. In addition, the survey asked teachers to estimate their monthly use of community resources during the last school year (2010-2011), and then to estimate their monthly use of community resources for the following school year (2011-2012). The survey was administered to teachers participating in the CRW at the end of the last day of the workshop.

Faculty Learning Community Survey

The Faculty Learning Community Survey consisted of four demographic items (e.g., number of years at BGSU, gender) and several items that measured participants' perceptions of the quality and impact of the learning community. Most of the items were measured on a five-point scale, with 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly Agree. The survey was administered online at the end of the school year to faculty members participating in the NWO Faculty Research Community.

Teacher Beliefs Instrument

The Teacher Beliefs Instrument consists of two sections. The first section measures teachers' self-efficacy and outcome expectancy beliefs regarding science teaching. Some examples of items from the first section include, "I know the steps necessary to teach science concepts effectively," and "The inadequacy of a student's science background can be overcome by good teaching". The items in this section are measured on a five-point scale, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

The second section lists several teaching strategies and asks teachers to rate their perceptions of the importance of the strategies, their preparedness to use the strategies, and the frequency with which they use the strategies. Some examples of the teaching strategies include, "Have students make connections between science and other disciplines," and "Ask students to explain science concepts to one another". The items in this section are measured on three different four-point scales, one for each sub-scale (i.e., importance, preparedness, frequency). For the Frequency scale, 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Frequently. For the Importance scale, 1 = Not Important, 2 = Somewhat Important, 3 = Important, 4 = Very Important. For the Preparedness scale, 1 = Not Prepared, 2 = Somewhat Prepared, 3 = Prepared,

4 = Very Prepared. The survey was administered online at the beginning and end of the school year to the teachers participating in the USE-IT project.

Technology Attitudes and Usage Survey

The Technology Attitudes and Usage Survey consists of three sections. The first section measures teachers' self-efficacy beliefs about using technology in the classroom. Some examples of items from this section include, "I am continually finding better ways to use technology in my classroom," and "I find it difficult to help students who have trouble using technology in my classroom". The items in this section are measured on a five-point scale, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

The second section lists several instructional technologies and asks teachers to rate a) how *familiar* they are with the technology, b) how *frequently* they use the technology, and c) how *prepared* they feel using the technology. Some examples of the instructional technologies included in this section are Google sites, Professional Learning Networks, and Skype. The items in this section are measured on three different four-point scales, one for each sub-scale (i.e., familiarity, frequency, and preparedness). For the Familiarity scale, 1 = Not Familiar, 2 = Somewhat Familiar, 3 = Familiar, 4 = Very Familiar. For the Frequency scale, 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Frequently. For the Preparedness scale, 1 = Not Prepared, 2 = Somewhat Prepared, 3 = Prepared, 4 = Very Prepared.

The third section lists several strategies to integrate technology and 21st century learning into the classroom. Teachers are asked to rate how *frequently* they use the strategies, and how *prepared* they feel to use the strategies. Some examples of items from this section include, "Have students use technology to complete collaborative learning tasks," and "Facilitate learning activities that foster 21st century skills". The items in this section are measured on two different four-point scales that correspond to the scales used for the frequency and preparedness sub-scales of the second section. The survey was administered online at the beginning and end of the school year to the teachers participating in the USE-IT project.

Observations

Observations were conducted for the USE-IT project and STEM in the Park. For the USE-IT project, the evaluator observed two professional development sessions to evaluate the quality of

the professional development. The field notes taken during the observations were analyzed to determine the extent to which the session facilitators used best practices to teach participants how to use educational technology in the classroom. For STEM in the Park, two members of the evaluation staff observed children and parents interacting with exhibitors at each activity table. The observational data collected during STEM in the Park was analyzed to determine the extent to which children and parents were engaged at each activity table.

Document Analysis

Document analysis was used for the evaluation of several NWO activities and projects. The following types of documents were analyzed in order to answer evaluation questions regarding the extent and nature of the NWO regional partnerships and the faculty research learning community: attendance records, internal NWO documents (e.g., meeting minutes, e-mail correspondence, grant proposals), and research abstracts.

Evaluation Findings and Conclusions

This section will describe the evaluation findings and conclusions regarding each NWO goal. The findings will be organized by the NWO goal with which they align, and the evaluation question(s) that they answer.

NWO Goal 1: Develop the expertise of pre-service and in-service teachers in STEM and STEM education disciplines.

The NWO activities and projects that are aligned to this goal are the NWO Inquiry Series, the NWO Symposium, the Community Resources Workshop, and USE-IT. The evaluation questions will be answered using data collected from the participants of these activities and projects.

What are the participants' perceptions of NWO activities and projects?

NWO Inquiry Series

The participants' perceptions of the NWO Inquiry Series were determined from the participants' responses to the NWO Inquiry Series Evaluation survey. The survey was completed every month

from September 2010 to April 2011 by an average of 37 participants, who were asked to rate the overall value of the Inquiry Series session they attended. Some sessions were better attended than others, and therefore some sessions have more evaluation data than others. On average, five to seven evaluation surveys were completed every month for each session.

The survey responses indicate that participants generally perceived the Inquiry Series to be engaging, valuable, informative, applicable, and motivating. Table 2 includes the participants' monthly responses for each session. The average survey scores were calculated using all of the responses about a particular session over the course of the Inquiry Series (e.g., 41 total responses for Engineering is Elementary from six different evaluation surveys).

Table 2. Inquiry Series participants' average survey scores by session

Survey Item	Average Survey Score per Session					Total
	Engineering is Elementary (n = 41)	Soil and Water (n = 29)	Take Math Outdoors (n = 34)	The Blade & Toledo Museum of Art (n = 29)	Uncovering Student Misconceptions (n = 43)	
The session was engaging	3.88	3.78	3.88	3.94	3.88	3.87
The information presented during the session was valuable to me	4.00	3.66	3.93	3.75	3.89	3.85
I learned something new from the session	4.00	3.94	4.00	3.93	4.00	3.97
I will incorporate the information from the session into my classroom lessons.	3.52	3.55	3.69	3.55	3.45	3.55
Attending the session made me feel more excited about teaching science, technology, engineering, and/or math	3.71	3.54	3.60	3.88	3.69	3.68
Session Totals	3.86	3.84	3.97	3.52	3.62	---

The Inquiry Series Evaluation survey also provided participants with the opportunity to write comments and suggestions about the session they attended at the Inquiry Series. The comments indicate that participants perceived the Inquiry Series to be a high quality event, with

many participants positively commenting about the hands-on nature of the Inquiry Series sessions, and the expertise of the session facilitators. Some of the participants wrote:

> *The session kept me engaged the entire time! It was hands-on and so much fun!*
>
> *I was surprised how hands-on the session was. We did a little bit of explanation and discovery through PowerPoint presentations, but then we did several activities which had us learning things that we could teach in our own classroom.*
>
> *The sessions was packed full of great hands-on activities to do in my classroom. A great session!*
>
> *[The facilitator] was engaging, fun, and had excellent handouts. [S/he] modeled what to do with kids through good stuff and "problem solving".*
>
> *[The facilitator] did a great job with the material that [s/he] had with [her/him]. [S/he] was an engaging, knowledgeable speaker.*

Despite the fact that overall, participants agreed the least with the statement, "I will incorporate the information from the session into my classroom lessons," participants frequently commented on their intentions to use the information and resources from the Inquiry Series in their classroom. Some participants wrote:

> *I came away with problem solving ideas to use with my students.*
>
> *I thought the information was valuable and could easily be used in the classroom.*
>
> *I think that the resources will be very beneficial in my classroom.*
>
> *I walked away with actual materials & ideas that can be easily implemented into upcoming themes & lesson plans! It was fun!*

NWO Symposium

The participants' perceptions of the NWO Symposium were determined from the participants' responses to the NWO Symposium evaluation surveys. Overall, the responses from the session evaluation surveys indicated that attendees perceived the Symposium sessions to be engaging and valuable. In addition, the responses to the online evaluation survey indicated that the

attendees perceived the 2010 NWO Symposium to be a high-quality professional development experience. When asked if they would attend again, 64% of the attendees reported they would be very likely to attend next year. Tables 3 and 4 contain the attendees' responses to the session surveys and online attendee survey, respectively.

Table 3. Attendees' average scores for each item on the session evaluation surveys

Survey Item	Average Score
The session was engaging	3.62
The information presented during the session was valuable	3.73
I learned something new from the session	3.79
The educational community would benefit from knowing the information presented during the session	3.73
The session was easy to follow and well organized	3.70
Total	**3.72**

Note: 1=Disagree, 2=Somewhat Disagree, 3=Somewhat Agree, 4=Agree

Table 4. Attendee responses and average scores from the attendee evaluation survey

Survey Item	Responses (n=115)				
	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Average Score
The sessions I attended were engaging	0	1	34	80	3.67
The information presented during the Symposium was important to me	0	2	32	81	3.69
I will incorporate the information/resources from the Symposium into my professional practices (e.g., teaching, administration, etc.)	0	2	28	85	3.72
I learned something new from the sessions I attended	0	0	16	99	3.86
As a result of the NWO Symposium, I feel more excited about the teaching and learning of science, math, and/or technology	0	3	36	76	3.63

The qualitative responses collected from the Attendee Evaluation Survey were analyzed to identify themes among the attendee responses. One major theme was attendees' perceptions of session variety. Several attendees commented on the wide variety of sessions that were available to choose from. Some of the attendees said:

> *I liked the variety of topics covered, and the fact that it felt like there were many different sessions that touched on each sub-STEM group (physical science, math, technology, etc).*
>
> *I am impressed with the high quality sessions! Lots of choices for a wide range of interests. Well done!*
>
> *I always enjoy the wide spectrum of topics offered at the [NWO] symposium.*

Another theme among the attendees' qualitative responses was the applicability of the NWO Symposium information. These responses augment the finding that 74% of attendees agreed with the following statement in the online evaluation survey: "I will incorporate the information/resources from the Symposium into my professional practices (e.g., teaching, administration, etc.)". The qualitative responses indicated that many attendees were planning to use (or were already using) the resources/knowledge gained at the NWO Symposium in their classroom. Some attendees said:

> *I attended several that were incredible and very informative. They were wonderful and I will certainly be using those strategies in my classroom!*
>
> *I have already started using some of the technology I learned that day and am satisfied with how I am using it.*

The presenters and vendors were asked to rank the 2010 NWO Symposium on several factors, including organization of the event, room set-up (for presenters), exhibit space (for vendors), available technology, volunteer assistance, the venue, the food, the Symposium staff, and the Symposium overall. The responses to these items indicate a positive overall experience. Each aspect of the Symposium (except for food) was perceived to be Excellent.

The presenters and vendors were also asked to comment about the success of their sessions and/or exhibit. Most of the presenters and vendors perceived their sessions/exhibits to

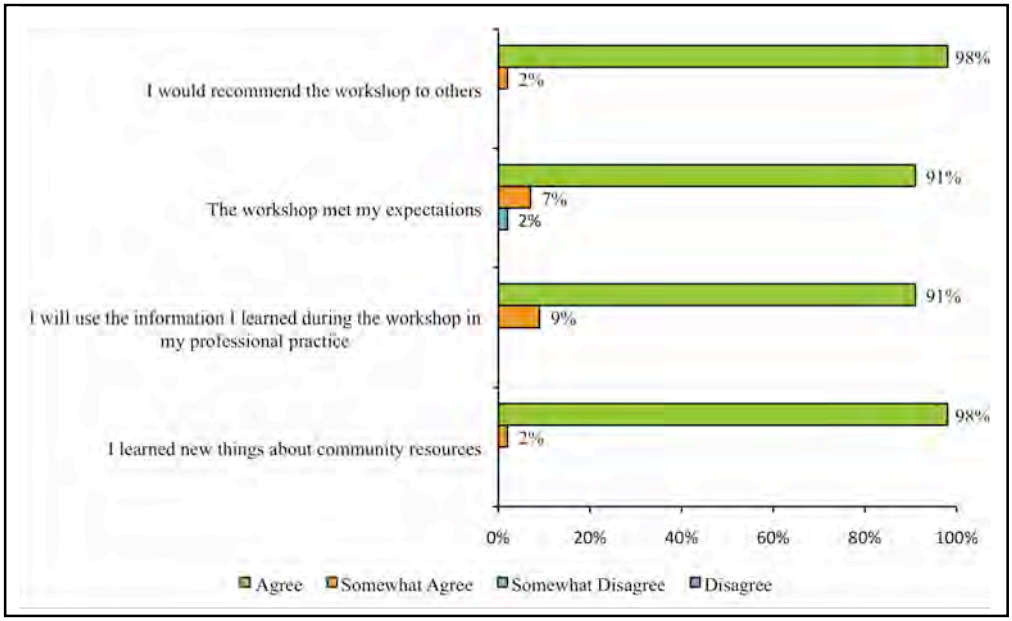
be successful based on the attendees' engagement and interest in their activities/exhibit and the verbal feedback they received from the attendees. When asked if their participation in the 2010 NWO Symposium was worthwhile, 52% responded "Definitely", 41% responded "Moderately", and 7% responded "Very slightly" or "Not at all". Many of the presenters and vendors explained that their participation was worthwhile because of the available networking opportunities. However, many presenters and vendors suggested that their participation was not as worthwhile as it could have been due to the low attendance. Some of the presenters/vendors wrote:

> *Attendance was down this year . . . so much so that I'm not sure it was worth our effort to be present as a vendor.*
>
> *Our session had only 8 participants, so the amount of time spent in preparation for the session was quite a lot for such a small group.*
>
> *Disappointed that there weren't more people there. Many sessions had just a handful of participants.*

Community Resources Workshop

The participants' perceptions of the 2011 Community Resources Workshop (CRW) were determined using the responses from the Community Resources Workshop Evaluation Survey. The participants were asked to rate their level of agreement/disagreement for four statements regarding the quality/value of the workshop. Overall, the participants' responses indicated that the participants perceived the workshop to be highly valuable. More than 90% of the participants agreed with all four statements. Figure 1 illustrates the participants' responses (n=45) to each of the four statements.

Figure 1. Participants' perceptions of the 2011 Community Resources Workshop



USE-IT (Uniting Science Education, Inquiry, and Technology)

The participants' perceptions of USE-IT were determined using the Inquiry Series Evaluation Survey (since the USE-IT professional development sessions took place in conjunction with the NWO Inquiry Series). The teachers who participated in USE-IT generally perceived it to be valuable and applicable to their classroom teaching. Many teachers wrote about their plans to use the technology addressed during USE-IT in their classroom:

> *I'm pretty excited to use my FlipCam in the classroom.*
>
> *I loved the information on Skype! I hadn't thought of using it in my classes but will now!*
>
> *I loved the sharing of documents with Google documents, but was thrilled to learn about the questionnaire feature – I'll be using that right away!*

The teachers' responses also indicated that the teachers liked the format of the sessions, with the facilitators modeling the use of the technology before the teachers were given time to try the technology on their own. Several teachers mentioned the benefits of the guidance provided by the facilitators, given the teachers' lack of experience with the technology being addressed.

Another aspect of the professional development that the teachers perceived to be particularly valuable was the sharing of information and experiences among colleagues. A large portion of the last professional development session was devoted to "sharing out" about the teachers' experiences during the year. Many teachers wrote about the benefits provided by this practice, and suggested that more "share out" time should be incorporated into the project.

> *Seeing what other teachers were thinking and their challenges was helpful. We could problem solve together.*
>
> *The colleague share was the most helpful. More of this would be appreciated.*
>
> *I think it would be valuable to have "share out" time each week, and allow different people to share their favorite websites and tech ideas.*

What is the impact of NWO activities and projects on participants?

Community Resources Workshop

The impact of the 2011 Community Resources Workshop was determined by measuring the change in teachers' awareness of and attitudes toward the use of community resources in their classroom. The teachers responded to the following questions on the Community Resources Workshop Evaluation survey:

- I am aware of the educational resources/services that are offered by local organizations
- I can confidently integrate community resources into my lesson plans
- Using community resources in my lesson plans can get my students excited to learn

The participants gave two responses for each of these statements – one to represent their opinion at the end of the CRW and another to represent their opinion as it was before the CRW. Wilcoxon tests were conducted to evaluate whether the participants' responses significantly changed as a result of the CRW. The results indicated that teachers significantly improved their awareness of and attitudes toward the use of community resources in their classroom as a result of the CRW. Teachers' average survey scores are found in Table 5.

Table 5. Changes in teachers' awareness of and attitudes toward using community resources

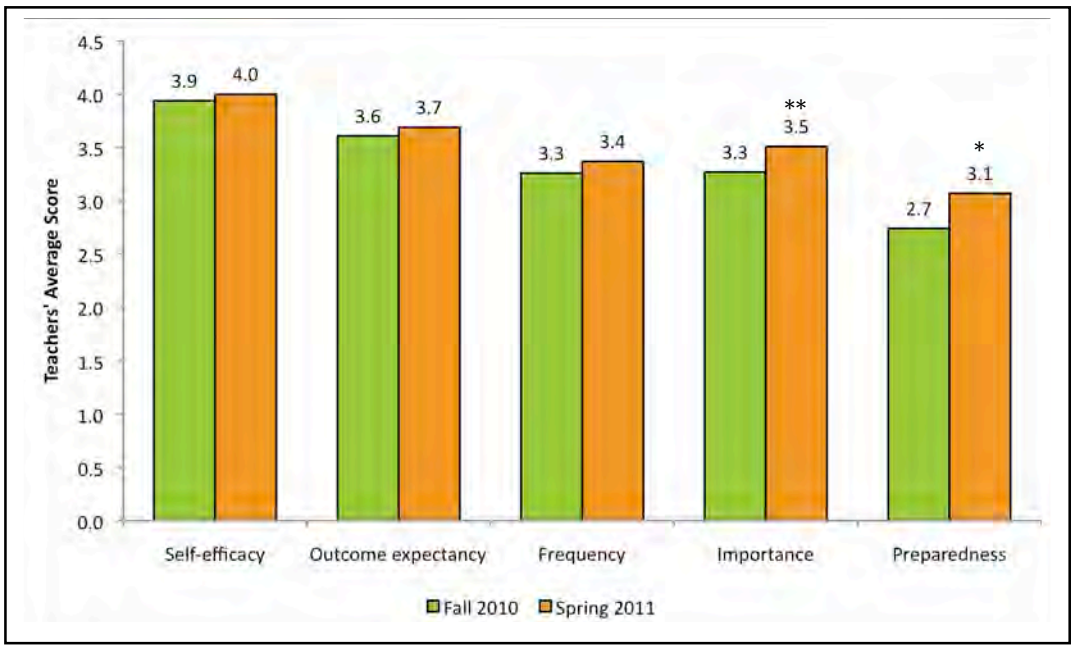
Survey Item	Average Pre-CRW Score (S.D.)	Average Post-CRW Score (S.D.)	Wilcoxon test p-value
I am aware of the educational resources/services that are offered by local organizations	2.44 (.69)	4.00 (.00)	< .001
I can confidently integrate community resources into my lesson plans	2.52 (.66)	3.87 (.34)	< .001
Using community resources in my lesson plans can get my students excited to learn	3.28 (.77)	4.00 (.00)	< .001

Note: Any p-value less than .05 is considered significant

USE-IT

The impact of USE-IT was determined by measuring the change in teachers' beliefs and behaviors regarding science teaching and technology integration with the Teacher Beliefs Instrument and the Technology Attitudes and Usage Survey, respectively. Figures 2 and 3 illustrate the teachers' average survey scores from before and after the project.

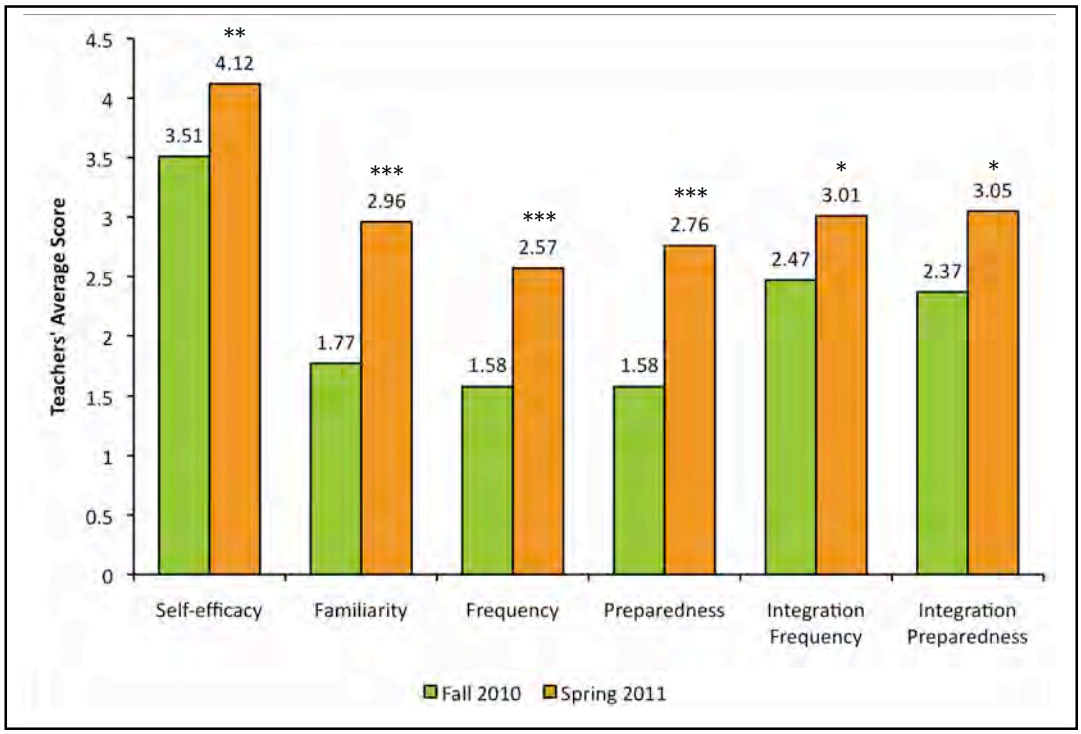
Figure 2. Changes in USE-IT teachers' beliefs and behaviors regarding science teaching



*Note: * p < .05, ** p < .01; Self-efficacy and outcome expectancy were measured on a scale of 1-5, and all others were measures on a scale of 1-4.*

The results of the Teacher Beliefs Instrument indicate that after USE-IT, teachers believed reform-based science instructional strategies to be more important, and felt more prepared to use the strategies than before the project. Teachers did not improve their self-efficacy or outcome expectancy beliefs regarding science teaching, nor did they more frequently use reform-based strategies after the project than before. These data suggest that USE-IT may have helped teachers to see the importance of reform-based science teaching and to feel more prepared to use reform-based strategies. The lack of a control group makes it difficult to attribute the observed change in beliefs solely to USE-IT – especially since the effect sizes weren't that large – but it's likely that the project did, to some extent, positively influence teachers' beliefs about science teaching.

Figure 3. Changes in USE-IT teachers' beliefs and behaviors regarding technology integration



*Note: * p < .05, ** p < .01, *** p < .001; Self-efficacy and outcome expectancy were measured on a scale of 1-5, and all others were measures on a scale of 1-4.*

The results demonstrate that after participating in USE-IT, teachers 1) felt more self-efficacious about integrating technology in their classroom, 2) were more familiar with the

technology addressed during the project, 3) used the technology addressed during the project with greater frequency, 4) felt more prepared to use the technology addressed during the project, 5) used technology integration and 21st century learning strategies with greater frequency, and 6) felt more prepared to use technology integration and 21st century learning strategies.

Conclusions

The evaluation findings indicate that NWO was successful in achieving its goal of developing the expertise of pre-service and in-service teachers in STEM and STEM education disciplines. Teachers generally had positive perceptions regarding the NWO Inquiry Series, NWO Symposium, Community Resources Workshop, and the USE-IT project. These activities and projects provided opportunities for both pre-service and in-service teachers to develop their expertise in STEM and STEM education. The teachers' written comments on the evaluation surveys suggested that teachers intended to use the knowledge and resources gained from the NWO activities and projects in their classroom. Furthermore, teachers improved their attitudes about STEM and STEM education as a result of participating in the NWO activities and projects.

NWO Goal 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.

What are the participants' perceptions of NWO activities and projects?

OJSHS

The participants' perceptions of the Ohio Junior Science and Humanities Symposium (OJSHS) were determined using the OJSHS Evaluation survey. Both students and non-students (e.g., teachers, parents, paper and poster judges, OJSHS staff/volunteers) were asked to rate several components of the 2011 OJSHS, including the evening events, keynote presentation, awards ceremony, and the 2011 OJSHS overall. Overall, the participants' had positive perceptions of the 2011 OJSHS, with more than 80% of participants rating most components as "Good" or "Excellent". The students' and non-students' responses are shown in Tables 6 and 7.

Table 6. Student perceptions of the 2011 OJSHS

OJSHS Component	n	Mean
Wednesday and Thursday evening activities	67	3.69
Keynote presentation	69	3.81
Paper and poster judges	79	2.96
Organization of the poster presentation space	69	2.97
Organization of the paper presentation space(s)	65	3.68
Awards ceremony	68	3.38
T-shirts	78	3.28
2011 OJSHS Overall	80	3.70

Note: 1=Poor, 2=Average, 3=Good, 4=Excellent

Table 7. Non-student perceptions of the 2011 OJSHS

OJSHS Component	n	Mean
Online registration process	11	3.00
Wednesday and Thursday evening activities	12	3.83
Keynote presentation	15	4.00
Organization of the poster presentation space	22	3.45
Organization of the paper presentation space(s)	17	3.82
Awards ceremony	12	3.58
2011 OJSHS Overall	22	3.77

Note: 1=Poor, 2=Average, 3=Good, 4=Excellent

Students rated the paper and poster judges and the organization of the poster presentation space lower than any other aspect of the 2011 OJSHS. Accordingly, many of the students' written responses addressed the judges and the poster space. Three students mentioned that a larger variety of judges (in terms of expertise) would have improved the paper and poster judging. Several students noted that the space for poster presentations was too small, and a few students further commented that some students had more space than others.

Non-students rated the online registration and the organization of the poster presentation space lower than any other aspect of the 2011 OJSHS. The comments explained that the "posters were a bit more crowded this year than in the past" and that there "needs to be better defined poster space for each participant". The only comment about the online registration was that "teachers need a little more information to ensure that the students are registered".

In addition to rating the OJSHS, participants were also asked to describe their experience at the 2011 OJSHS in their own words. Two of the main themes that emerged from the students' responses were the opportunity for student-student interaction, and the learning that occurred among students. Some of the students wrote:

> *I liked the opportunity to meet other students and listen to the research that they were conducting*
>
> *I loved getting to know people who have similar interests in STEM education.*
>
> *I really enjoyed seeing other people's projects and research. There are many fields that I found very interesting and never would have thought to explore.*
>
> *I loved that I was being exposed to other people that did research in levels higher than me because it helped me create ideas of projects that I could do.*

The overall tone of the non-student responses was positive – many participants reported that they enjoyed different aspects of the event as well as the event in general. The poster judges specifically stated that they enjoyed talking to the students. Many of the non-student participants echoed the comments of the students, emphasizing the role of OJSHS in fostering positive student-student interactions. One participant wrote:

> *It's more than a competition. It allows the students to interact with one another and share ideas. I love that aspect of it.*

When asked about their intentions to participate in the future, 83% of students who are eligible to return next year (i.e., not 12th graders) reported that is very or moderately likely that they will be involved with the OJSHS next year. Similarly, 87.5% of the non-student participants reported that is very likely that they will be involved with the OJSHS next year. The remaining 12.5% reported that it is not all likely that they will be involved with OJSHS next year.

STEM in the Park

The participants' perceptions of STEM in the Park were determined using the Public Perceptions of STEM in the Park survey and the Exhibitor Perceptions of STEM in the Park survey. Most of the attendees who responded to the survey reported that attending STEM in the

Park moderately improved their awareness of community STEM organizations and resources and their knowledge about STEM. Also, most attendees also reported that their children were substantially engaged in STEM activities during STEM in the Park, and substantially improved their knowledge about STEM as a result of STEM in the Park. Table 8 includes the attendees' responses to several items from the Public Perceptions of STEM in the Park survey.

Table 8. Attendees' perceptions of STEM in the Park

Survey Item	Responses (n = 171)				
	Not at all	Very slightly	Moderately	Substantially	N/A
How much did STEM in the Park increase your knowledge about STEM?	1.8%	12.4%	64.5%	21.3%	-
How much did STEM in the Park increase your awareness of community organization and resources?	2.4%	11.2%	44.4%	42.0%	-
How much do you think STEM in the Park increased your children's knowledge about STEM?	1.2%	6.4%	39.2%	48.5%	4.7%
How engaged were your children with the STEM in the Park activities?	0%	1.2%	12.9%	81.8%	4.1%

Overall, the attendees' comments were very positive. Many respondents wrote how impressive the event was, and expressed their gratitude for being able to attend a free community event. Some examples include:

> *In this day and age it was SO WONDERFUL to go to such a great, organized, and educational program ... for free. Sorry, but most people with kids don't have a lot of extra money. So, thanks! We also took advantage of the lessons to help with our homeschooling science class.*

> *I would really like to thank all the workers and volunteers for making such a great impression on my husband and I and my boys. We also were so impressed with all the activities and fun simple things that got my kids interested in STEM. I really hope you will continue to have this event every year. Thank you very much for a great Saturday!!!!*

The exhibitors' survey responses mirrored those of the attendees, in that they demonstrated that STEM in the Park was an engaging event for children and adults. Almost all of the exhibitors reported that the children seemed excited and enthusiastic about participating in the activities. Three of the exhibitors wrote:

> *The children embraced the activity, asked great questions and worked hard to excel. I was pleasantly surprised at the level of participation, and the level of enthusiasm.*
>
> *Children dragged their parents to the table. Some children kept coming back – one 12 year old spent the entire time "helping" with the demo. Children enjoyed passing the critters on to the other children and telling them what they knew about the critters.*

To what extent do NWO activities and projects attract and sustain interest in STEM?

OJSHS

Since student participation in the OJSHS is voluntary, it is likely that most student participants already have a fair amount of interest in STEM. However, the OJSHS seeks to provide an environment that nurtures and grows students' interest in STEM. In order to determine the role of the OJSHS in attracting and sustaining interest in STEM, students were asked to rate their level of agreement with three statements. The students' responses to the statements are found in Table 9.

Table 9. The impact of the OJSHS on students' interest in STEM

Survey Item	n	Mean
Participating in the OJSHS increased my interest in STEM research.	79	3.58
The OJSHS provided me with valuable opportunities to network with other students and STEM professionals.	80	3.39
The OJSHS increased my desire to pursue a career in STEM.	80	3.30

Note: 1=Definitely Disagree, 2=Kind of Disagree, 3=Kind of Agree, 4=Definitely Agree

The non-student participants were also asked to describe the impact of the 2011 OJSHS on students' interest in and understanding of STEM. Although it is likely that most of the participating students were already interested in STEM, many non-student participants suggested that the OJSHS provided students with motivation to continue learning and conducting research about STEM. Some of the participants wrote:

> *The experience seems to greatly motivate the students to do more in the field. They want to research more and do higher quality work after watching the paper presentations.*
>
> *The younger students especially were appreciative of feedback and showed marked interest in returning next year.*
>
> *This event piques our students' interests and has many interested in continuing research and returning next year!*

STEM in the Park

The main purpose of STEM in the Park is to engage children and adults in hands-on STEM activities in order to improve and sustain their interest in STEM. The impact of STEM in the Park on the attendees' interest in STEM was determined by the attendees' responses to the Public Perceptions of STEM in the Park survey. Table 10 includes the attendees' responses to two survey items regarding interest in STEM.

Table 10. The impact of STEM in the Park on attendees' interest in STEM

Survey Item	Responses					
	Much less	A little less	About the same	A little more	Much more	N/A
Do you think your children are more or less interested in STEM after coming to STEM in the Park?	0%	0%	9.9%	28.1%	58.5%	3.5%
Is your family more or less likely to do activities related to STEM after coming to STEM in the Park?	0%	0%	17.8%	40.8%	41.4%	-

The findings indicate that STEM in the Park was successful at improving children's interest in STEM. The survey responses also indicate that STEM in the Park had a lasting impact

on attendees' interest in STEM. As a result of attending STEM in the Park, most attendees (41%) reported being much more likely to do other STEM-related activities. Moreover, many families reported doing some of the STEM in Park activities at home, and more families anticipated doing the activities in the future. Many of the respondents' wrote about the lasting impact of STEM in the Park on their children.

> *My three girls absolutely loved this event. Everyone that they have seen since then they tell them about what they did and learned and show them some of the activities they had made.*
>
> *My 4 and 7 year old girls were fully engaged, loved every activity, and we did science activities for the remainder of the day as a result. They are still flying their airplanes, and are making preparations to make baking soda rockets later this week.*
>
> *First time I say my kids so engaged – they simply could not get over their DNA – they carried it all over with them for days!*
>
> *We have already planted our garden (thanks WBGU!) and look at the seeds every morning to see if they've germinated.*

Conclusions

The evaluation findings indicate that NWO was successful in achieving its goal of attracting and retaining students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty. Although STEM in the Park and OJSHS were mainly centered around students, there were opportunities for teachers and faculty to be involved. The evaluation findings indicate that students, teachers, and faculty perceived the activities to be valuable, engaging, and influential in the improvement and sustainability of students' interest in STEM.

NWO Goal 3: Conduct and communicate collaborative research in STEM and STEM education disciplines.

What are the participants' perceptions of the research community?

The participants' perceptions of the research community were determined using the Faculty Learning Community Survey. Seven faculty members completed the survey at end of the 2010-2011 school year. There were five items on the survey that measured participants' general perceptions of the learning community. The participants perceived the learning community to be meaningful, well organized, and conducive to collaboration. The participants' survey responses are found in Table 11.

Table 11. Participants' perceptions of the Faculty Research Learning Community

Survey Item	Responses (n = 7)					Mean Score
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
At each meeting I learned something new and practical	0	14% (1)	14% (1)	29% (2)	43% (3)	4.0
This LC was a meaningful/productive professional development experience	0	0	14% (1)	29% (2)	57% (4)	4.4
The LC meetings were well organized	0	0	0	43% (3)	57% (4)	4.6
The lines of communication in this LC were open and strong	0	0	0	43% (3)	57% (4)	4.6
This LC felt like a community	0	0	14% (1)	0	86% (6)	4.7

Note: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

What is the nature of participants' contribution to STEM teaching and learning research?

The participants in the Faculty Research Learning Community worked throughout the year on collaborative research projects regarding STEM teaching and learning. The participants' contribution to STEM teaching and learning research can partly be determined by the number of presentations and manuscripts that resulted from the research community. Four articles were

prepared for peer-review during the 2010-2011 Faculty Research Learning Community: (The abstracts for these articles can be found in Appendix A.)

- "Developing and Validating an Instrument to Measure Motivation, Engagement, & Attitudes in College Biology" by Matthew L. Partin, Eileen Underwood and W. Robert Midden
- "Use of Help Sheets on Exams to Motivate Students in College Algebra" by Beth Burns and Lindsey Haubert
- "Technology Integration in Early Childhood Science Education" by Rick Worch, Lan Li and Terry Herman
- "Effectiveness of In-Class Activities on Student Learning and Motivation in Introductory Astronomy" by Kate Dellenbusch and John Liard

In addition to these four research articles developed during the 2010-2011 Faculty Research Learning Community, the NWO Team wrote eleven other articles during the 2011 fiscal year. The NWO Team meets bi-weekly during the academic year, and consists of faculty and staff from several STEM and STEM education departments in Bowling Green State University.

Conclusions

The evaluation findings demonstrated that NWO was successful in achieving its goal of conducting and communicating collaborative research in STEM and STEM education disciplines. The Faculty Research Learning Community was the main activity that facilitated communication and collaboration regarding research among STEM and STEM education faculty members. The participants in the learning community perceived it to be valuable and well organized. And as a result of the learning community, many of the participants developed, conducted, and communicated research studies regarding STEM teaching and learning. A broader contribution to STEM teaching and learning research is recognized by considering the work of the faculty and staff that are members of the NWO Team.

NWO Goal 4: Develop and sustain a regional collaborative alliance including university, school, informal education, and business partners through a shared vision and collaborative spirit for tackling current STEM education issues.

The evaluation findings in this section will describe *how* NWO developed and sustained regional partnerships, and *what* those regional partnerships looks like. The first part of the evaluation question will be answered by breaking down the actions of NWO into those that sustained and developed existing regional partnerships, and those that created and developed new regional partnerships. The second part of the evaluation question will be answered by analyzing meeting minutes and other internal documents to determine the nature of NWO's regional partnerships.

To what extent do NWO activities and projects develop and sustain regional partnerships, and what is the nature of those partnerships?

During the 2011 fiscal year, the NWO activities and projects fostered and maintained regional partnerships. Almost all NWO activities and projects were founded upon long-standing relationships between NWO and its partners. As such, the implementation of these activities and projects successfully sustained and developed existing regional partnerships with multiple colleges and departments at Bowling Green State University, K-12 schools, educational service centers, community organizations, and businesses.

Existing regional partnerships were sustained in several ways. First, NWO professional development activities (i.e., Inquiry Series, Symposium, USE-IT, Community Resources Workshop) during the 2011 fiscal year were largely facilitated by regional partners. The NWO Symposium included dozens of sessions facilitated by teachers, university faculty, informal educators, and STEM business professionals from northwest Ohio. Likewise, the Community Resources Workshop was coordinated and facilitated by several community organizations and businesses in the area. Second, STEM in the Park provided an opportunity for NWO partners to come together as a group to improve STEM awareness and interest in northwest Ohio. This event was mutually beneficial to all partners involved, in that partners could provide community outreach and perhaps increase their community visibility while contributing to an overall successful NWO event. Third, the NWO Collaborative Council (NWOCC) met six times from

October 2010 to May 2011. Twenty-one individuals from partnering K-12 schools, institutions of higher education, community organizations, and businesses attended the NWOCC meetings. The NWOCC meeting minutes indicate that the content of the meetings mostly included updates and announcements regarding activities and projects implemented by NWO and its partners, and discussions about educational issues in northwest Ohio (e.g., changing Ohio standards in science and math). The meetings were collaborative in nature, in that members of the NWO staff and the NWOCC attendees discussed together the current and future activities of NWO, and determined what role each partner could play in the activities to ensure that the partners are mutually benefited. Fourth, NWO participated in various ways in the development and implementation of regionally collaborative grant proposals. NWO provided assistance to several of its partners in the development and implementation of their grant projects. NWO assisted in the writing of seven grant proposals, the recruitment of participants for 41 activities and grant projects (via e-mail communication and the dissemination of NWO newsletters), and the evaluation of four grant projects. Some of these services were not provided by NWO in the past, and therefore added another collaborative aspect to existing partnerships. The existing partnerships also provided support to NWO in the development and implementation of grant projects. Partnering K-12 schools and community organizations drafted letters of support and assisted in the planning for NWO grant proposals. Fifth, the NWO Team, which consists of NWO staff and BGSU faculty members from the Colleges of Arts of Sciences, Education, and Technology, met biweekly during the school year. The NWO Team meetings provided a venue for collaborative discourse among STEM and STEM education faculty and staff regarding the current and future direction of NWO. According to the NWO Team meeting minutes, topics of discussion included NWO funding opportunities, modifications to NWO goals, and upcoming NWO events and activities. Although these partnerships were contained within BGSU, and therefore were not necessarily regional, the decisions and suggestions made within the meeting had regional impacts. Sixth, the NWO Inquiry Series and Symposium were again hosted at Rossford High School and Penta Career Center, respectively. It was the third and second time, respectively, that those partners hosted the Inquiry Series and Symposium.

In addition to sustaining existing partnerships, many NWO activities and projects also created new partnerships. For example, many local organizations that had never before partnered with NWO participated in STEM in the Park in 2010. However, the most salient examples of

new partnerships are the activities associated with the development of the NWO STEM Consortium, which was created in January 2011 as a result of funding from the Ohio Board of Regents in association with the Ohio STEM Learning Network and the Ohio STEM Committee. The funding allowed NWO to expand its network of partners across the 29 counties of northwest Ohio. The preparation and implementation of this grant proposal resulted in new partnerships with educational organizations in more distant regions of northwest Ohio. Several school districts in the southern and eastern most regions of northwest Ohio, for example, became major partners in the NWO STEM Consortium. Bob Midden, the director of NWO, cultivated new K-12 school partnerships by visiting dozens of schools in northwest Ohio throughout the development and implementation of the NWO STEM Consortium grant.

One component of the NWO STEM Consortium was the formation of a regional Advisory Board, consisting of representatives from all regions in northwest Ohio. The Advisory Board met twice during the 2011 fiscal year – once in March and again in May. The first meeting introduced the main purposes of the STEM Consortium and included discussions about the STEM education resource center that was being developed by NWO, a strategic plan for the NWO Consortium, and identifying and recruiting STEM business and government partners. The second meeting included discussions about the effective assessment of STEM learning, identifying best practices for promoting STEM learning, and inspiring administrators and communities to adopt best practices in STEM teaching and learning.

The NWO Consortium activities also allowed for the expansion of NWO's communication network by funding a print newsletter and a STEM resources website. Two print newsletters were sent during the 2011 fiscal year – one in February and the other in May – to more than 5,000 educators, STEM professionals, business people, and government employees in Ohio. The comments from a few members of the Consortium Advisory Board suggest the newsletters were visually appealing, and included valuable information for NWO partners. The STEM resources website (www.nwostemresources.org) was developed from January to June of 2011. Members of the NWO STEM Consortium Advisory Board previewed the site, and were asked to provide feedback regarding its formatting, navigation, and usefulness. The feedback from the Advisory Board was positive, suggesting that the resource center was nicely formatted, easy to navigate, and useful to stakeholders like teachers, administrators, informal educators, businesses, and parents.

The expansion of NWO's communication network also resulted in more individuals receiving the NWO e-newsletter. About 2,000 teachers, administrators, university faculty, undergraduate and graduate students, community partners, and business partners received the NWO e-newsletter every month during the 2011 fiscal year. Starting in June of 2011, the number of e-newsletters sent by NWO substantially increased from about 2,000 to over 6,000. Two evaluation surveys were administered online regarding the NWO e-newsletters. One survey was administered in February, and another survey was administered in May. Survey respondents were asked to rate several aspects of the e-newsletters (e.g., length, layout), and provide comments and suggestions for improvement. The survey results indicate that readers of the NWO e-newsletter typically read at least 75% of the newsletter, and perceive it to be "good" in terms of its length, layout, readability, and value. Furthermore, the results demonstrate that the e-newsletter increases awareness of STEM resources and opportunities, and is a source of motivation for improving STEM education. Table 12 includes the results of the two NWO e-newsletter evaluation surveys.

Table 12. Survey respondents' perceptions of the NWO e-newsletter

Survey Item	Average Score	
	February	May
Length	3.0	3.0
Layout	2.9	3.1
Readability	3.1	3.3
Value	3.3	3.2
Overall Satisfaction	3.2	3.3
The e-newsletter was useful to me*	3.6	3.7
The e-newsletter increased my motivation to improve STEM education in my school/organization*	3.4	2.4
The e-newsletter increased my awareness of STEM professional development opportunities, grants, and resources*	3.8	3.9

Note: Rating scale was 1=Poor, 2=Average, 3=Good, 4=Excellent for the items without an asterisk, and 1=Disagree, 2=Somewhat Disagree, 3=Somewhat Agree, 4=Agree for the items with an asterisk

The comments and suggestions provided by survey respondents on the February evaluation survey led to several changes in the format and layout of the NWO e-newsletters (e.g., change in background color, layout of articles). The survey data from the May evaluation survey suggest that the changes were successful in improving the layout and readability of the e-newsletter.

Conclusions

The evaluation findings demonstrate the NWO was successful in achieving its goal of developing and sustaining a regional collaborative alliance including university, school, informal education, and business partners through a shared vision and collaborative spirit for tackling current STEM education issues. NWO maintained it current partnerships with almost every activity and project implemented during the 2011 fiscal year. In addition, new partnerships were formed across northwest Ohio, due largely to the funding of the NWO STEM Consortium in January of 2011. The NWO partnerships were collaborative in nature, with NWO both providing and receiving assistance in various forms from its partners throughout northwest Ohio.

NWO Goal 5: Support higher education faculty and future faculty in pursuit of the best practices in STEM and STEM education disciplines to enhance undergraduate and graduate education.

What is the impact of the research community on participants' STEM research and teaching practices?

The impact of the research community on participants' STEM research and teaching practices was determined by the participants' responses on the Faculty Learning Community Survey. There were five items on the survey that measured the participants' perceptions regarding the impact of the learning community on their STEM research and teaching practices. Most of the participants agreed that the learning community resulted in the implementation of new pedagogies and learning strategies, which resulted in an increase in student learning. Furthermore, the participants' responses suggest that the learning community successfully

facilitated the development of collaborative research projects. The participants' survey responses are found in Table 13.

Table 13. The impact of the Faculty Research Learning Community on participants' STEM research and teaching practices

Survey Item	Responses (n = 7)					Mean Score
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
As a result of this LC, I have initiated new pedagogies and learning strategies in my classroom or program	0	0	29% (2)	14% (1)	57% (4)	4.3
This LC was useful for increasing student learning	0	0	14% (1)	29% (2)	57% (4)	4.4
This LC was useful for establishing collaborations, finding collaborators, broadening my professional network	0	14% (1)	0	0	86% (6)	4.6
As a result of this LC, I have increased the number of learner-centered activities in my classroom or program	0	0	33% (2)	33% (2)	33% (2)	4.0
As a result of this LC, I have incorporated activities/assessments that allow students to reflect on their learning	14% (1)	0	43% (3)	0	43% (3)	3.6

Note: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

Recommendations

The evaluation findings suggest that the NWO participants generally have positive perceptions of NWO activities and projects. The participants perceived the activities and projects to be meaningful and valuable for their professional practice, and successful in providing engaging and interesting STEM-related learning opportunities. However, the evaluation findings also suggest ways that the NWO activities and projects can be improved. Most NWO evaluation instruments encouraged participants to comment about the strengths and weaknesses of the NWO activities and projects, and suggest methods for improvements. The participants'

comments and suggestions, in conjunction with other evaluation data, were used to develop several recommendations regarding the future implementation of the NWO activities and projects. This section of the report will outline and describe recommendations for several NWO activities and projects.

STEM in the Park

Consider making STEM in the Park longer than three hours.

Many of the attendees commented that there was not enough time to participate in all of the activities at STEM in the Park. In fact, the only negative comment made by many attendees was that the event did not last long enough. A few exhibitors also suggested that the event be extended.

Reorganize the lunch area to shorten the lunch line for attendees and give volunteers and exhibitors easier access to lunch.

Most attendees stood in line for lunch for more than 20 minutes, and many went to eat inside the Student Union to avoid the long line. In addition, many of the exhibitors did not get to eat lunch. The lunch area could be reorganized by creating two serving lines instead of one. Also, a separate serving line could be created for volunteers and exhibitors.

Make it easier for attendees to locate certain activity stations.

Many of the attendees suggested that a map should be distributed that allows the attendees to find certain activity stations. While mapping every specific activity station may be unreasonable, NWO could designate several "zones" in which certain activity stations can be found. A map displaying these zones and the activity stations within them could be distributed to the attendees at the registration table.

Recruit more volunteers to facilitate the event.

Several attendees and exhibitors mentioned that the some of the activity stations were crowded. To alleviate the congestion, it is suggested that either 1) exhibitors bring additional staff or 2) NWO recruit more student volunteers to interact with the attendees at the activity station. This would allow for more of the attendees to engage in the activities at the same time.

Make curricular and instructional decisions regarding the content of the project based on teachers' previous experience and current needs.

The findings of the project indicated that while some teachers had very little experience with technology, while other teachers had a lot of experience with technology. As a result, some teachers suggested that the pace of instruction be slowed down, while other teachers suggested that the pace be sped up. In order to enact this recommendation, facilitators might consider formatively assessing the teachers in the project regarding their knowledge and experience with certain types of technology. These data could then be used to guide the development of the professional development sessions. Formative assessment could also be used to identify the types of technology that teachers want and need to learn about.

Provide more structured examples regarding the use of technology for science teaching.

The project would likely be more beneficial to science teachers if the technology addressed during the project were situated within a science context. For example, facilitators might do an actual science lesson with the teachers as the students, using technology throughout the lesson. This way, teachers could explicitly see how the technology might be used in their science classroom.

Allow teachers more time to explore the technologies that are being addressed, specifically in how they could be used in the classroom.

Many teachers suggested that they be given more time to explore the technologies being addressed during the project. According to the professional development observations, teachers were given a fairly large amount of time to play around with the technology in each session, but this time seemed to be aimed at understanding the technical aspects of the technology (e.g., the features of the technology, how to find one's way around the technology). However, perhaps teachers could be given time to explore how the technology might be used in the classroom. Teachers could be encouraged to try out their idea in their classroom before the next professional development session, and then share with the rest of the class how their idea worked.

Continue to allow teachers to "share out" at each of the monthly sessions.

Throughout the project, teachers were given several opportunities to share with the other teacher participants how they were implementing technology in their classroom. This seemed to be valuable aspect of the project, and would be worthwhile to ensure that teachers were given the opportunity to have these discussions at each professional development session. Teachers' comments on the session evaluations illustrated that sharing their progress and listening to other teachers' progress was an important and beneficial part of the monthly sessions.

NWO Symposium

Designate a specific time during the NWO Symposium when attendees can visit the vendor exhibits.

The vendors gave many positive comments about the "split lunch" format, and overall seemed to encourage the continuation of the format for future Symposia. One vendor, however, stated that the format might have been better if sessions had not been offered at the same time. Along the same line, some teachers reported not eating because they did not want to miss any of the sessions that were offered during the lunch hours. Therefore, it is recommended that the split lunch format be continued but that sessions not be offered during those hours. This would reduce crowding, provided greater flexibility, and explicitly provide time for browsing vendor exhibits.

Include a keynote presentation at the beginning of the Symposium

Some of the presenters and vendors commented about the absence of a keynote speaker for the 2010 NWO Symposium. The addition of a keynote presentation at the beginning of future Symposia would provide an opportunity for staff to welcome attendees and make announcements, and would allow attendees to greet each other and organize their day (e.g., choose which sessions they want to attend). A keynote speaker may also motivate more people to attend future Symposia.

Decrease the number of sessions that are offered at the Symposium.

The most salient comment among the presenters was the low attendance at the 2010 NWO Symposium. Attendees also commented about the low attendance, mostly suggesting that session discussions would have been stronger and more meaningful if more people had attended. The low session attendance (average of 10) was likely due to the combination of low overall attendance and an increased number of offered sessions for the 2010 NWO Symposium. Therefore, one potential solution is to decrease the number of sessions that are offered for future Symposia. The removal of the lunch sessions and addition of a keynote speaker will help to reduce the number of sessions in the future. In addition, repeated sessions could be eliminated in order to decrease the number of sessions during each hour of the Symposium. Therefore, even if the overall attendance remains low, a smaller number of sessions would result in higher per session attendance.

Include a chart of sessions in the program book.

A few attendees suggested that a chart of sessions be included in the program book in order for attendees to visualize all of the sessions offered during the day. Although this suggestion was not mentioned by a large number of people, it may be a useful planning tool for NWO Symposium attendees.

Develop a new system of labeling sessions in the program book.

In 2010, as has been the practice in the past, sessions were labeled in the program book as Earth/Space Science, General Science, Life Science, Mathematics, Pedagogy, Physical Science, Pre-Service, and/or Technology according to their content. These labels, in addition to the session summary, are meant to provide the attendees with an idea of what the session is about, and whether or not it would be meaningful to attend. However, in many cases, all of the labels were applied to one session, thus making it difficult to discern what the session was really about.

Offer more technology and mathematics sessions, as well as sessions that focus on special needs education, cross-curricular education, and the new Ohio standards.

This suggestion is based on the attendees' responses to the following question: What educational issues/topics would be beneficial to address at the NWO Symposium next year? The most common responses were mathematics and technology integration. Even though the 2010 NWO Symposium was more balanced than in the past in terms of its content, attendees still suggested that more technology and mathematics sessions be offered. Attendees also suggested that is would be helpful to learn about cross-curricular education, special needs education, and the new Ohio standards.

Offer different food choices than what was offered for the 2010 NWO Symposium.

While some participants made positive comments about the food, many attendees, presenters, and vendors suggested that different food choices be offered in the future. The food was the only aspect of the NWO Symposium that received substantially lower ratings in 2010 than in 2009.

Modify the system by which posters are judged

This general suggestion is actually comprised of two more specific suggestions about the poster judging system. One suggestion, which came mostly from participating students, was to ensure a greater variety among the judges in terms of their expertise. Some students perceived that most of the judges came from the "hard science" fields, and suggested that more judges be recruited from fields like psychology and other social sciences. Another suggestion that was given by students and non-students alike was to have two judges evaluate each poster. This suggestion could be based on the fact the judging rubric contains several large scales that might be used differently by two different judges. Having a team of judges for each student might help to standardize the scoring process.

Re-organize the space for poster presentations

Issues regarding the space for poster presentations were among the most commented on by the 2011 OJSHS participants. Both students and non-students believe that changes need to be made to improve the poster space. The greatest concern was the lack of space that students had to present their posters. One non-student participant suggested that a ballroom be used instead of the room that was used this year. Another issue regarding the poster space was the lack of consistency in the amount of room that each student had to set up their poster. Since the poster space was made up of a series of tall panels, students who arrived early could potentially use more space than those who arrived late. One solution might be to establish measurement standards (for how tall and wide a poster can be) to which students must adhere. Not surprisingly, the poster presenters were the main source for this suggestion.

Continue to offer ice skating, curling, and campus lab tours

Many students provided positive comments regarding the non-presentation activities. Specifically, the students mentioned that they enjoyed ice skating, curling, and the campus lab tours. Some students, however, suggested that the lab tours be made optional or that students should be allowed to choose which lab(s) they tour. This would allow students to have more free time if they chose to, which was another common message among the students.

Community Resource Workshop

Provide opportunities for teachers to "network" during the workshop

A few teachers mentioned that having time to network with other teachers (i.e., discuss ideas among themselves as a group or in grade level groups) would have improved their experience at the CRW.

Add more/different resources to the CRW.

This recommendation is based on teachers' comments about two different issues related to the content of the CRW. First, teachers suggested a few resources that could be added to the CRW in the future. These resources included the S.S. Boyer, the Toledo Fire Museum, Kelly's Island, and Ritter Planetarium. Second, a few teachers suggested changing the resources every year to allow the same teachers to attend the workshop more than once. While it is probably not feasible to completely change the workshop every year, it does seem possible to add a few new resources each year (in place of some others). Also, continuing to focus on a new theme each year may allow repeat participants to learn how resources can be used in multiple ways for multiple subjects.

Seek out sources of funding that would decrease/eliminate participants' registration fee and provide teachers with some free resources to use during the school year.

Although some of the community resources presented at the workshop are free for teachers, many resources are not, and therefore are unlikely to be used by teachers due to their schools' budget constraints. If the Community Resources Consortium could locate external funding, they could provide participants with a free community outreach program for their classroom. In addition, external funding could be used to reduce or eliminate the participants' registration fee, which would likely increase the number of participants who attend the CRW, and expand the reach of the partnering community organizations.

Appendix A: Faculty Research Learning Community Article Abstracts

Developing and Validating an Instrument to Measure Motivation, Engagement, & Attitudes in College Biology

by Matthew L. Partin, Eileen Underwood, and W. Robert Midden

Student engagement is seen as an indicator of successful classroom instruction. Instruments are available to assess student engagement, but these can be long and cumbersome to administer. We set out to design and test an instrument that would examine not only engagement but also motivation and attitude. By modifying existing instruments, we have developed a tool of reasonable length that should allow us to assess student motivation, engagement and attitudes toward Biology in a non-majors Biology course and draw correlations between these constructs and student success in the course, as measured by grade. The instrument was tested in Fall 2010 with 183 nonmajor marine biology students. Multiple Regression results using Emotional Engagement, Control of Learning Beliefs, and Self Efficacy to predict Attitude Toward Biology explains 72% of the variance in Attitude Toward Biology (see Tables 2 & 3). Multiple Regression results using Intrinsic Goal Orientation, Self Efficacy, and Behavioral Engagement to predict Grades explains 50% of the variance in Grades (see Tables 4 & 5). The reliability of each construct was acceptable (see Table 1) with the exception of behavioral engagement (alpha=.547). This construct should be examined with factor analysis.

Appendix A: Faculty Research Learning Community Article Abstracts

Use of Help Sheets on Exams to Motivate Students in College Algebra

by Beth Burns and Lindsey Haubert

As the coordinators for Math 1120 (College Algebra I) and Math 1220 (College Algebra II); we have been experiencing unmotivated students that do not complete the necessary components of the course. This is resulting in a high failure rate for College Algebra I and College Algebra II. Our goal is to find effective ways to motivate the unmotivated students. It seems as though most students who do not perform well in a College Algebra class do not feel as though they are capable or doing the work and so give up immediately without trying. Some of them also assume that since they have seen the material in high school they don't need to attend class or do the homework.

We began with looking at what students were not doing. Beyond scoring poorly on exams, students were not completing their MyMathLab homework. This is a required online homework program that allows students to work through problems as many times as it takes to get the problem correct. The program offers help on problems and shows students how to do similar problems. We thought if students took the time to complete this effectively they should feel better about their skills and therefore should be in a better position to do will on the exams.

We looked into what would motivate a student to complete his/her homework assignments beyond assigning point values. During the Fall 2009 semester, we decided that every student who earned a 90% or better on every MyMathLab assignment would earn the right to use a Help Sheet on the final exam. The Help Sheet would contain useful information that was covered throughout the course; including properties, formulas, and directions for using the calculator.

Based on the extent of this project, at this time we are only going to look at the data for Math 1120. We are going to compare the final exam scores from the Fall 2008 semester to the Fall 2009 semester when the students could use the Help Sheet.

For Math 1120 only about 40% of the student's completed the necessary requirements to use a Help Sheet. We want to see if being able to use the Help Sheet by completing the homework made a difference in students' exam scores. We have looked at the difference in the student exam scores for those students who were able to use the Help Sheet versus those students that were not allowed to use the Help Sheet.

Appendix A: Faculty Research Learning Community Article Abstracts

Technology Integration in Early Childhood Science Education

by Rick Worch, Lan Li, and Terry Herman

This project examined the self-efficacy of preservice early childhood teachers for integrating technology into their science instruction. The treatment group (28 students) received special instruction in a variety of software tools and an annotated bibliography of software tools in their science methods course. The control group (26 students) received only the annotated bibliography. Self-efficacy was measured on two scales: Personal Efficacy scale and Outcome Expectancy scale. There was no significant difference on either self-efficacy scale between the treatment and control group prior to the treatment. Both groups showed a significant positive change in their personal self-efficacy for technology integration; however, only the treatment group showed a significant change in its outcome expectancy for technology integration. That is, only the treatment group was significantly more positive in its belief that if they integrate technology into their science instruction, students will benefit from it. The results suggest that even minor intervention can positively affect the self-efficacy of preservice teachers. Future studies may wish to examine the strength and persistence of self-efficacy gains and their impact on classroom instruction.

Appendix A: Faculty Research Learning Community Article Abstracts

Effectiveness of In-Class Activities on Student Learning and Motivation in Introductory Astronomy

by Kate Dellenbusch and John Liard

In an effort to enhance student learning, a current trend in education is to make the classroom a more active learning environment, with less emphasis on traditional lecture. In this study we examine the effectiveness of including collaborative, in-class worksheets on student learning in large introductory astronomy classes. Worksheets were given to students in ASTR 2120 ("The Solar System") during the semester. These worksheets were designed to help students work through the reasoning necessary to understand some of the more difficult concepts in introductory astronomy. To study the effectiveness of the worksheets, one section of ASTR 2120 was given the worksheets, while a second section of the course, taught by the same instructor, was not. The class that did not receive the worksheet was given similar content through traditional lecture. This study has been conducted over multiple semesters. Although not statistically significant, the data from one semester suggest that students may gain a better fundamental understanding of concepts through the inclusion of collaborative in-class worksheets.