CENTER FOR INTEGRATIVE AND NATURAL SCIENCE

Annual Report
2014-2015
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Letter from the Director

Dear Friends,

It has been an exciting year at CINSAM. Over the 2014-2015 year, CINSAM directly impacted over 7000 people, students and educators at preschool-undergraduate levels as well as members of the community! These people engaged with STEM through teacher professional development, summer camps, faculty development, STEM days and other programs. This level of engagement wouldn’t have been possible without CINSAM’s many partners across the NKU and Northern Kentucky communities. As you read through these pages, you will learn more about all of the programs that took place over the last year and the people who make them happen.

Among the people who have made CINSAM’s programs happen are several CINSAM staff who are moving on to other positions. We give thanks to all of them on our “Goodbyes” page, but I also want to thank them all for their leadership and service to CINSAM here. They are, Billy Russell, Beth Russell, Carrie Holloway, Lila Brindley, Rosie Santos, and CINSAM’s former Director, Dr. John Farrar. We wish you all the best on your current endeavors!

Looking at the past year, you can see that CINSAM has continued many of its previously existing activities, such as summer camps through our Ashland program, the Toyota USA-funded Next Generation STEM Classroom project, CINSAM Grants, the NASA Fellowship to train STEM educators, and others. But we also brought new programs to campus, such as STEM Connections (also funded by Toyota) and the FIRST Lego League’s Kentucky state tournament.

This fall, as we mark CINSAM’s 15th anniversary, we are celebrating all that CINSAM has accomplished in its first 15 years and looking to the future to imagine what the CINSAM of the next 15 years can do. What do our region’s students, faculty and staff need to succeed? How can CINSAM best catalyze meaningful advancements in STEM education in our region and on our campus? How can we make sure every student experiences a high quality STEM education?

I am new as Interim Director of CINSAM and am very much looking forward to the next two years I have in this role. During this time, I plan work with our team and our stakeholders to chart a path for the CINSAM of the future. And I invite you to partner with us on this journey. As I mentioned above, CINSAM can’t do what we do without strong collaborations with teachers, students, professors, school districts, university administration, community non-profits, foundations and others. And our students won’t get the education they deserve unless we all put our heads and hands together in service to our students’ education.

To all those who have already partnered with CINSAM—those of you whose names appear in these pages and in previous annual reports, and all you whose work has contributed to CINSAM’s goals over the past 15 years—thank you. We look forward to more partnerships and a better STEM education for every student.

Thank you,

Madhura Kulkarni
CINSAM was established in 2001 as NKU’s Program of Distinction. In many ways, CINSAM has become a defining program of NKU over the last 15 years. As the deans of the colleges of Arts & Sciences, Education & Human Services, and Informatics, we are pleased to recognize all that CINSAM has accomplished through its work with our faculty, staff and students this year. Our colleges’ goals and core values are strongly supported by CINSAM’s goals and mission, and our relationship with CINSAM allows for an unprecedented level of support and integration between our programs.

We fully support CINSAM’s efforts to integrate our disciplines and to partner with our faculty to foster innovation and creativity in science, technology, engineering, and mathematics (STEM) and environmental education. By bringing together the people and activities of the 6 CINSAM departments—Teacher Education, Computer Science, Mathematics and Statistics, Biological Sciences, Chemistry, and Physics, Geology, & Engineering Technology—CINSAM facilitates an atmosphere of exploration allowing administrators and faculty to be more effective in achieving the CINSAM mission. With CINSAM’s help, all three colleges are engaged in promoting the use of best practices in curricular and co-curricular offerings for our students.

CINSAM encourages cross-disciplinary interactions and generates significant experiential learning opportunities for undergraduates by awarding our faculty with competitive research grants. In many cases, the research funded by these grants has been leveraged to obtain larger national grants, thereby supporting undergraduate research experiences even further. You can read more about what these grants have been used for and how students have been involved on the following pages. CINSAM also provides our faculty with STEM and environmental outreach opportunities allowing them to connect with local P-12 students and teachers. And their direct work with teachers (both pre-service and in-service) and administrators has brought wide acclaim to CINSAM and the Center for Environmental Education as a source of expertise and professional development in STEM and the environment. This acclaim has come with millions of dollars in external support for these two Centers’ activities from the Toyota USA Foundation, the Ashland Foundation, NASA, and others as you will see in the forthcoming pages.

Above all, CINSAM provides an extra layer of cohesiveness to our colleges that we do not see at many other universities, uniting us in the common mission to improve P-16 teaching, learning, and scholarship across the STEM disciplines. As we embark on this next year, we look forward to seeing how CINSAM continues to advance this mission at NKU, in Northern Kentucky, and beyond.

Katherine Frank
Dean, College of Arts & Science

Kevin Kirby
Dean, College of Informatics

Cindy Reed
Dean, College of Education and Human Services
VISION, MISSION & GOALS

MISSION
To promote excellence in STEM education at all levels by advancing and integrating teaching, learning, and scholarship in the STEM disciplines.

VISION
To facilitate NKU becoming a national leader in STEM education, outreach and scholarship.

GOALS
- Facilitate the recruitment, retention, and graduation of all STEM students,
- Support faculty scholarship and undergraduate research in the STEM disciplines,
- Promote excellence in the teaching of STEM at all levels,
- Develop partnerships with the community and its leaders for informal STEM education.
IMPACT

CINSAM staff and our partners have worked hard this past year to provide innovative and creative STEM opportunities for teachers and students in Northern Kentucky. This effort has had a considerable impact!

In the 2014-2015 year, CINSAM reached 56,554 people in the northern Kentucky and greater Cincinnati region – including both direct and indirect impacts* – through its effort to improve STEM education by advancing and integrating teaching, learning, and scholarship in the STEM disciplines.

**Direct Impact:**

<table>
<thead>
<tr>
<th>NKU Faculty</th>
<th>STEM Professionals &amp; Members of the Community</th>
<th>P-12 Teachers</th>
<th>P-12 Students</th>
<th>NKU Students</th>
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<tbody>
<tr>
<td>267</td>
<td>120</td>
<td>1,008</td>
<td>5,218</td>
<td>465</td>
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**Indirect Impacts:**

<table>
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<tr>
<th>P-12 Teachers</th>
<th>P-12 Students**</th>
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<tr>
<td>760</td>
<td>48,000+</td>
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*Direct impacts: the number of participants in CINSAM programs; Indirect impacts refer: the number of individuals who, having not attended a CINSAM event, received instruction on CINSAM-provided lessons by a CINSAM program participant.

**Indirect P-12 student impacts were calculated by taking the sum of the students a CINSAM PD participant teaches and assumes CINSAM-provided curriculum is taught to those students. When available, exact class size was used. If class size was unavailable, we estimated that P-8 educators taught 25 students while 9-12 educators taught 75 students (3 classes of 25 students each). These estimates were based off of 2014-2015 class sizes in the northern Kentucky region.
OUR PEOPLE

JOHN FARRAR, PH.D.
DIRECTOR
Dr. John Farrar led CINSAM from July 2013 through June 2015. He came to CINSAM from Abraham Baldwin Agricultural College in Tifton, GA where he served as Head of the Science Department and Professor of Chemistry. In addition to overseeing all of CINSAM’s programs and activities, John was also involved with the Science and Engineering Fair of Northern Kentucky and the Kentucky FIRST® LEGO League. He received his M.S. and Ph.D. in organic chemistry from Vanderbilt University.

MADHURA KULKARNI, PH.D.
ASSISTANT DIRECTOR, INTERIM DIRECTOR (STARTING JULY 2015)
Madhura Kulkarni has led the development of several CINSAM programs and worked with many of our regional and national partners. She is also part of several university-wide and broader initiatives, including the Kentucky Girls STEM Collaborative, the STEM Equity Pipeline Project, and the Greater Cincinnati STEM Collaborative. Madhura earned her Ph.D. in biogeochemistry from Cornell University.

REEDA HART
STEM OUTREACH DIRECTOR
Reeda Hart is a nationally recognized master teacher responsible for the creation and direction of the Next Generation STEM Classroom project as well as all of CINSAM’s embedded outreach. She teaches STEM lessons in district partners’ classrooms, modeling best practices for teachers. She has over 25 years of teaching experience and has been with CINSAM since 2004. She received her master’s degree in education from Xavier University and graduated with a Rank I in Teaching in Primary School and Gifted Education (Grades 1-8) from NKU in 1990.

THOMAS BRACKMAN
STEM RECRUITMENT DIRECTOR
Thomas Brackman leads CINSAM’s efforts in recruiting high school students into the STEM disciplines. With his extensive background in geology, Thomas also offers professional development sessions in science and engineering. In addition to his position at CINSAM, Thomas is the director of the Laboratory for Applied Geophysics and is a lecturer in geology.

CARRIE HOLLOWAY
STEM OUTREACH SPECIALIST
Carrie Holloway serves as a master teacher for the Next Generation STEM Classroom project. She also organized and hosted the STEM Connections teacher professional development program during the 2013-2014 school year. Carrie has 14 years of experience in the education profession as an Instructional Coach, a middle grades Science and Math teacher, and an elementary teacher. She is a National Board Certified Teacher in the area of Early Adolescent Science. Carrie is also an NKU alumna – having received a bachelor’s degree in Elementary Education in 1999, a master’s in education in 2003, and completed her certification as an Education Specialist in Education Leadership in 2013.

LILA BRINDLEY
STEM OUTREACH SPECIALIST
Lila Brindley led the middle school portion of our Next Generation STEM Classroom Project. As a National Board Certified Teacher with 10 years of experience, she teaches STEM lessons, modeling best practices for teachers from fifth through seventh grade in Northern Kentucky. Lila earned her Bachelor of Arts in Biology from Thomas More College and her Master of Arts in Education from the University of Kentucky.

BETH RUSSELL
PROGRAM MANAGER
Beth Russell coordinated events for CINSAM and assisted in developing programs. She was the Executive Director of the Science and Engineering Fair of Northern Kentucky as well. She specializes in new media, including web design, graphic design, photography, and social media. Beth holds a bachelor’s degree in Media Informatics from NKU (2012).

CHRISTINA BELIS
PROGRAM MANAGER
Christina Belis, hired in June 2015, coordinates events for CINSAM and leads the CINSAM marketing and social media campaigns. She came to NKU from South Carolina where she coordinated a research program and STEM workshops for a specialized, residential science & mathematics high school. Christina earned her master’s degree in biology from the University of North Florida in 2011.
BILLY RUSSELL
NETWORK LAB MANAGER
Billy Russell provided personalized technical support and training to CINSAM and the academic departments housed in the Natural Science Center. He managed and maintained the computers in classrooms, offices, research labs, and the planetarium. Billy was introduced to NKU at one of CINSAM’s first summer camps for high school students in 2002. He graduated from NKU in 2012 with a bachelor’s degree in Computer Information Technology.

DANIELLE CIRELLI
ACADEMIC SPECIALIST
Danielle Cirelli serves as the Academic Specialist for CINSAM. She handles department logistics, hiring, and budget processes, and supervises student assistants. In addition, Danielle is an active member in the NKU community. She teaches a section of University 101 each fall semester, and serves on the Advisory Board for University 101 during the spring. Danielle is currently pursuing her second master’s degree in the NKU Master of Business Administration program and maintains a busy schedule as a freelance trumpet performer and educator. She received her Bachelors of Arts degree from Northern State University in Aberdeen, SD, and her Master of Music degree from Morehead State University in Morehead, KY.

ROSIE SANTOS
INTERIM DIRECTOR, CENTER FOR ENVIRONMENTAL EDUCATION
Rosie directs the efforts of the Center for Environmental Education including educator professional development, P-12 and community outreach, and undergraduate programming. She is a certified Professional Environmental Educator with years of experience developing and facilitating educational programming for all generations of learners. She is particularly interested in providing young people from the inner-city with the opportunity to connect with nature. Rosie is an NKU alumna with bachelor’s degrees in Spanish and Integrative Studies. Currently, Rosie is working on her Masters of Community Planning from the University of Cincinnati.

VICTORIA WEGENER
STUDENT ASSISTANT
MAJOR: MATHEMATICS
“I loved working with CINSAM because I was able to be involved with many different activities and programs.”

KAREN ELY
STUDENT ASSISTANT
MAJOR: ANTHROPOLOGY
“I love NKU because of the great opportunities it has allowed me to explore and the people I have met since I started here.”

KELLEY RIES
STUDENT ASSISTANT
MAJOR: ENVIRONMENTAL SCIENCE
“I love how involved CINSAM is with such a wide age range of students. Watching them create and understand new concepts, no matter their age, is amazing to me.”

BROOKE TURNER
STUDENT ASSISTANT
MAJOR: MATHEMATICS & STATISTICS
“Working at CINSAM is fantastic because there’s never a dull moment. The staff is great to work with and every day brings something new and exciting.”

CASEY KELLEY
STUDENT IT ASSISTANT
MAJOR: COMPUTER SCIENCE
“CINSAM has been wonderful with regards to individuals I’ve been able to meet and the networking and opportunities provided.”
This year, CINSAM said goodbye to several valued staff members...

In January, Billy Russell, CINSAM’s Network Laboratory Manager, took a job in Austin Texas, working for Athenahealth, Inc. as a Corporate Support Associate. Billy had a long history with CINSAM, starting with his involvement as a high school student in a 2002 CINSAM summer camp! He then got his BS in CIT from NKU and later joined CINSAM’s information technology team as an assistant to our former Network Laboratory Manager and finally, took on that role himself in 2012.

With Billy’s move to Austin, we also lost his wife, Beth Russell, in March. Beth was CINSAM’s Program Manager. She too is an NKU graduate, earning her degree in Media Informatics soon after she joined CINSAM’s staff in 2012. She started out at CINSAM as our Academic Specialist, then became our Program Manager in 2013. In these roles, she brought her talents for organizing and design, as well as a great enthusiasm for our work. Now she is the Assistant to the Chair of Computer Science at the University of Texas-Austin.

In June, Carrie Holloway, one of CINSAM’s Outreach Specialists (since 2013), was recruited to become an Associate Principal at Kenton County School District’s new Summit View STEAM (science, technology, engineering, arts, and mathematics) Academy. Carrie earned her undergraduate and master’s degrees at NKU as well as her principals’ certificate. This education and her background as a teacher and an instructional coach (prior to her work at CINSAM) combined with her experience as an esteemed STEM professional development provider at CINSAM to make her a fantastic catch for this new academy. The opportunity was a dream role she couldn’t pass up!

In July, Dr. John Farrar, CINSAM’s Director, transitioned to the Chemistry Department as an Associate Professor. As Director, he missed being able to teach and is now getting much more time in the classroom. He came to CINSAM 2013 as Director from Abraham Baldwin Agricultural College, where he served as chair of the Science department. At CINSAM, he worked hard to support our staff in executing CINSAM’s mission. He also brought the FIRST Lego League’s state tournament to NKU, bringing the university broad attention at the state scale for support of elementary and middle grades engineering and computer science education.

Also in July, Lila Brindley, CINSAM’s other Outreach Specialist also returned to one of our region’s grade schools, Bracken County High School. She is now a high school teacher and is enjoying the chance to be back in her own classroom, focusing on her favorite subject, biology. Lila came to CINSAM’s Next Generation STEM Classroom project in 2014 and brought her enthusiasm for science with her. She worked with Reeda Hart and Carrie Holloway to make CINSAM’s professional development and three of our summer camps great learning experiences for teachers and students.

Finally, at the end of summer, Rosie Santos started graduate school at the University of Cincinnati’s prestigious School of Planning. Starting in 2013, she served as Interim Director of the Center for Environmental Education. Incredibly, she took on this great responsibility immediately after completing her bachelor’s degrees in Spanish and Integrative Studies at NKU, during which time she gained great experience as an intern with the CEE. Rosie not only sustained CEE operations during this time, she grew its activities, served as a mentor for undergraduate fellows in our NASA-funded STEM teacher-preparation program, and raised the profile of environmental education at NKU and in our region.

Saying good-bye to so many friends and co-workers is bittersweet. Although we will miss seeing them every day in our offices, they are all off on great new adventures and taking on new challenges. However, we continue to work with nearly all of them: Beth is still helping out with our regional science fair, as are Carrie and John, who are still board members. Carrie and Lila continue to partner with us on teacher professional development in STEM. John is serving on a CINSAM search committee. And Rosie is working with us joint presentations of the NASA project and other environmental education opportunities.
The Center for Environmental Education is an NKU institute closely affiliated with CINSAM led by Interim Director, Rosie Santos. As a member of the Kentucky University Partnership for Environmental Education, the organization’s mission is to improve regional environmental literacy through coordinating environmental education across the Northern Kentucky region.

To achieve this mission, CEE provides training and programming that includes:

- Professional development (PD) for pre-service and in-service formal and informal educators
- P-12 outreach
- NKU partnerships and opportunities
- Community environmental stewardship projects and events

EDUCATOR PROFESSIONAL DEVELOPMENT

The CEE offers professional development for educators to promote environmental literacy for all members of the community. This year, CEE impacted 165 P-12 educators through their participation in a number of STEM Expos for educators, field trips, and three “RECAP” (Reflection and Exploration of Content, Alignment, and Pedagogy) portions of Next Generation STEM Classroom Project (ngSC; see page 20 for more information on ngSC) sessions at Dry Ridge, River City and Ryland Elementary Schools. CEE students prepared water quality resources to distribute to teachers and Rosie Santos facilitated a demonstration of a watershed model for teachers.

P-12 OUTREACH

More than 1,500 students participated in CEE P-12 outreach opportunities during the 2014-2015 year. Some of the highlights from the year include:

- “Get Into The Woods” Summer Camp: In partnership with the Boone County Environmental Education and Nature Center, this camp specifically targeted middle school students from the urban core. All participants were Covington residents from Spanish speaking families with varying levels of English competency. The weeklong camp sought to familiarize students with nature concepts, including aquatic sampling, basic flora and fauna identification, resource availability and ecosystem services. The culminating event was a litter cleanup in Covington.

- Elementary STEM Days activities: Hosted by CINSAM in both the fall and spring, CEE students participated by conducting water quality lessons aimed at teaching local 4th grade students about watershed and biological indicators of stream health.

NKU UNDERGRADUATE PROGRAMMING

Throughout the year, 178 NKU students had the opportunity to both attend and lead programs hosted by the CEE, including:
• **Invasive Species presentation:** In partnership with the NKU Honors Program, CEE presented information about invasive species including honeysuckle, pear trees, garlic mustard and winter creeper, and participated in a service project to remove them from the NKU Honors Programs’ trails.

• **Vermicomposting workshops:** Hosted by the NKU Scripps Howard Center for Civic Engagement, CEE partnered with the NKU Wellness Center to give a presentation about the positive environmental and human health impacts of utilizing worms to compost. In addition, CEE organized an instructional vermicomposting workshop in conjunction with the 2015 annual NKU Earth Day Celebration.

**COMMUNITY PARTNERSHIPS**

In total, 395 members in the Northern Kentucky/Cincinnati community participated in events hosted in collaboration with the CEE, including:

• **Reforest Northern Kentucky:** The CEE contributed to the organization of this event which brings together volunteers and students to plant thousands of trees on hundreds of northern Kentucky acres.

• **Kentucky Association for Environmental Education Sustainability Symposium:** Rosie Santos sits on the Board of Directors for KAAE and served as the co-chair for the annual Sustainability Symposium with the theme of Local Food: Perceptions and Misconceptions. Rosie hosted a breakout session about the basics of vermicomposting.

**NASA**

NKU’s CEE, CINSAM and several environmental education programs across the state are collaborating on a NASA-funded program called “Increasing the Number of Qualified STEM Educators Through the Use of the Interdisciplinary STEM Theme of the Environment.” The project requires each center to hire a cohort of students to be “NASA Fellows” responsible for developing a STEM Learning Module while participating in an online learning community to share their experiences and seek input from content experts. NKU’s module focuses on using mobile apps to develop lessons about regional water quality.

**STUDENT PROFILES**

**CLAY TYLER**
(Middle Grades Education – Mathematics & Science Teaching Fields; 2013 – 2015)

“My time with the CEE was full of experiences that I would NOT have been able to receive anywhere else. I didn’t just leave with knowledge; I left with real-world experiences. The CEE provided me with experiences in learning, professional development, teaching, developing lesson plans, community outreach, professional connections, presentations, and more. Teaching students about the environment goes beyond simply teaching content; they need to learn how they can apply the information in real world settings.”

**LIZZY ANDERSON**
(Elementary Education and Special Education; 2014 – Present)

“Working for the CEE has been a transformative experience for me. The CEE helped reinforce my career trajectory, provided me with environmental field experience, as well as opportunities to participate in event planning, networking, curriculum writing, real world teaching, and formal presentations. Through hands-on experiences, I learned the content I needed to successfully write lesson plans and teach. In addition, I learned new teaching methodology to encourage students to think critically and lead classroom discussion. Ultimately, CEE has instilled a passion for environmental education, which will continue into my classroom and professional life.”

**SARAH HUME**
(Biological Sciences; 2014 – Present)

“Prior to working at the CEE, I had years of experience in as a naturalist, activist and tutor. This job has revolutionized my concept of what teaching can be. I will use my experience at the CEE as a framework in which I can place all of my coursework in the education program. This will allow me to build a greater and more in depth understanding of the content of my classes. This will allow me to optimize my learning experience and become an effective educator to the benefit of not only me, but my students as well.”

**DEREK ILES**
(Geology; 2014 – 2015)

“This NASA Fellowship has been such a positive experience for me. Since joining this fellowship my knowledge of water quality has grown extensively. I also learned a lot about environmental education and the importance of critically thinking about environmental topics. Though I don’t intend to be an educator in the future, I do plan to be an environmental educator throughout my career. This position has prepared me to do that.”
TEACHER SPOTLIGHTS

EMILY GILES
ELEMENTARY MATH & SCIENCE CONSULTANT, KENTON COUNTY SCHOOLS
In 2012, Emily Giles began working with CINSAM and a team of 4th grade teachers throughout the Kenton County School District. During this project, she and the teachers would meet every 6 weeks for the CINSAM Next Generations STEM Classroom (ngSC) project. After each session, she helped teachers reflect on their learning experience and organize how best to implement the lessons into their own classrooms. After observing the rich learning experiences these teachers were getting, she began working to get more teachers involved. In both 2013 and 2014, Kenton County expanded their CINSAM partnership to first include teachers in grades 3-5 and then to include primary. As the district elementary consultant, Emily provides support to the faculty and administration for all eleven elementary schools in Kenton County, including support through Professional Learning Communicates, Professional Development days, District-wide trainings, etc. Many of the CINSAM ngSC lessons have been written into Literacy Design Collaborative modules that are taught in all 11 elementary schools and teachers have been provided with training and support in an effort to implement these lessons within the modules. During the 2015-2016 school year, Kenton County will be expanding the CINSAM ngSC project to grades P-6, impacting 70 science teacher leaders.

MELISSA COLSON
4TH GRADE TEACHER, DRY RIDGE ELEMENTARY, GRANT COUNTY SCHOOLS
Melissa Colson first began participating in CINSAM programming ten years ago when she contacted Reeda Hart, CINSAM STEM Outreach Director, after overhearing a few teachers talking about “this amazing lady in a painted lab coat who would come and visit their schools and teach students science lessons.” Reeda began regularly visiting Melissa’s classroom to share new science lessons with her students. Melissa also began attending various STEM professional development events that CINSAM offered. In 2012, Melissa’s district, Grant County, was one of the first districts to become involved with the Next Generation STEM Classroom (ngSC) Project. The experiences gained through ngSC and CINSAM have given Melissa a new sense of confidence and enthusiasm in her teaching and has helped her connect with fellow teachers and administrators as she learned to be the best science teacher she could be.

“I AM SO THANKFUL FOR THE CINSAM OUTREACH PROGRAM AND BLESSED THAT NKU SAW THE NEED TO REACH OUT AND HELP THE CHILDREN OF OUR COUNTY.”

– MELISSA COLSON
STUDENT SPOTLIGHTS

ALYSSA FARMER
MAJORS: MATHEMATICS, STATISTICS
Alyssa’s first introduction to CINSAM came when she was awarded a CINSAM scholarship upon enrollment at NKU. Double majoring in Mathematics and Statistics and minoring in Computer Science, Alyssa is also a Student Ambassador for the College of Arts & Sciences, a member of Project SOAR and the NKU Honors Program, as well as a Math & Stat Lab tutor for algebra, pre-calculus, calculus, and statistics. Alyssa is also involved in undergraduate research, working with NKU faculty, Dr. Aimee Krug and Dr. Dhanuja Kasturiratna, and another NKU student to develop a model to predict the presence or absence of heart disease in patients using data collected by the Cleveland Clinic Foundation.

ALEX OLIVAN
MAJORS: GEOLOGY, CHEMISTRY
Alex, a double major in Chemistry and Geology and recipient of the NKU Excellence Scholarship, became a CINSAM Scholar as an NKU freshman in 2014. He is now a SOAR Scholar as well, and beginning in fall 2015, Alex will be serving as a SOAR Teaching Assistant and Peer Mentor. Through his involvement with CINSAM and the SOAR Project, he spent summer 2015 conducting research with Dr. Patrick Hare in the Department of Chemistry. His research focused on measuring the extent of photodegradation of pharmaceutical contaminants, specifically fluoxetine and progesterone, in surface waters, as well as characterizing the photoproducts following degradation. This research has significant implications not only for our local waterways, but also for waterways around the country.

“TODAY, I AM READY TO TAKE ON ANY CHALLENGE THAT IS THROWN AT ME AND I CERTAINLY COULD NOT HAVE DONE IT WITHOUT ALL OF THE OPPORTUNITIES THAT WERE GIVEN TO ME AS A STEM STUDENT AT NKU.”

“BEING A CINSAM SCHOLAR HAS DEFINED MY EXPERIENCE AT NKU. IF IT WERE NOT FOR CINSAM, I WOULD NOT HAVE DECLARED A DOUBLE MAJOR IN STEM DISCIPLINES AND I DEFINITELY WOULD NOT HAVE BEEN INVOLVED IN RESEARCH THIS SUMMER – AN EXPERIENCE I HAVE ENJOYED VERY MUCH.”
FACULTY SPOTLIGHTS

**SEYED ALLAMEH**
ASSOCIATE PROFESSOR OF MECHANICAL AND MANUFACTURING ENGINEERING TECHNOLOGY
Since 2004, Dr. Allameh has worked with CINSAM in many roles, including applying and receiving grants for research and outreach activities, participation in CINSAM events such as STEM Connect and summer camps, and getting help with student projects.

Biomimicking, one of his research areas, has been greatly boosted by a CINSAM grant resulting in 5 published refereed papers and 10 international conference presentations, enabling more than 10 students to conduct R&D toward their senior design projects. He also led outreach activities including workshops for girls and minorities. By collaborating with area teachers, he delivered student-centered training sessions, including rapid prototyping, robotic construction, electronic design, materials selection and testing, and welding. In addition to student sessions offered at CINSAM’s Engineer Career Day, CINSAM Night, area school visits and other activities during fall and spring semesters, Dr. Allameh also participated in CINSAM’s summer camps to offer a broader range of services. Weeklong camps dedicated to engineering, and women and minorities in science, allowed trips to Toyota, Ford, KLH and Cardinal providing close observation and hands-on activities in the areas of manufacturing, electricity and surveying. All this was in addition to at-school sessions on Physics, Materials, and Mechanics with invited faculty from Physics and Engineering Technology.

Closer contacts with area schools became possible for Dr. Allameh through the CINSAM-Middle School Alliance which offered workshops for teachers in materials selection, nanotechnology and robotics. The alliance also provided robotic kits to teachers for demonstration in their classes. These kits were also used in other outreach activities, including robot-building activities for 90 middle school students from Bracken County brought to NKU through KY connections. Dr. Allameh acknowledges the work of Katy Drinkhouse and Lila Brindely, NKU faculty who greatly contributed to the success of our Middle School Alliance during a 4 year period.

Dr. Seyed Allameh gives special thanks to Madhura Kulkarni, the present Director, and current staff who diligently move the center to reach its mission and goals. He also acknowledges the great assistance received from former directors including John Farrar, Kristi Haik, Dan Curtin and Phil Schmidt.

**DIANA MCGILL**
PROFESSOR OF CHEMISTRY
Dr. Diana McGill was part of the faculty team who formulated the original CINSAM proposal and has watched the transformation of CINSAM into what it is today.

“So many years ago, while we were brainstorming and coming up with what a CINSAM could look like, I’m not sure any of us truly had an idea of the full extent of the impact CINSAM would have on NKU students, faculty and the entire region of P-12 teachers and their students. It’s really spectacular all that CINSAM and its staff does!”

In her roles as a faculty member and as a department chair, she has participated in CINSAM-sponsored outreach and recruiting events, led CINSAM funded undergraduate research projects and mentored faculty in their CINSAM-funded research proposal submissions.

“When I came back from my own sabbatical after my chair term was finished, I was able to go back into the research lab and work over the summer with five wonderful students. Without CINSAM’s support, this work would have been impossible”.

Dr. McGill’s latest work with CINSAM has involved NKU’s freshman CINSAM Scholarship recipients and the highly successful Scholarships, Opportunities, Achievements, and Results program. Last year, for the first time, SOAR and CINSAM scholarship recipients were placed in mixed cohorts in the SOAR first-year seminar program. In this two-semester sequence of courses, students are supported with intensive mentoring and advising to offer retention support to CINSAM Scholars to help them be successful and graduate in four years. The first class of CINSAM/SOAR Scholars is off to a great start!

“All of us working on SOAR wanted to spread the success we have found to other groups of students. Because of CINSAM’s commitment to retention of STEM majors, branching out to work with their CINSAM scholarship students was an absolute no-brainer. We’re thrilled to be able to include the CINSAM Scholars in our SOAR activities and build an even larger group of students with the strong bonds that form in that first year together.”
This year marked the inaugural year of STEM Connections, an integrated approach to providing content-based professional development (PD) sessions to P-12 teachers in the northern Kentucky and Cincinnati areas along with NKU pre-service teachers. STEM Connections replaced the CINSAM Alliances in the 2014-2015 year and was developed as a way for teachers to further explore the interdisciplinary nature of science, and discover how individual disciplines fit into the larger fields of science and engineering.

During the 2014-2015 year, CINSAM offered a total of six STEM Connections, each centered on a Disciplinary Core Idea and the sub-ideas from the Next Generation Science Standards as well as the Early Childhood Standards. Each night began with a keynote speaker from the designated field of study and then P-12 teachers had the opportunity to attend two break-out PD sessions led not only by NKU faculty and staff, but also local P-12 teachers. These programs reinforced the collaborative nature of the STEM disciplines by demonstrating the crosscutting relationships between the fields and giving teachers the tools to implement them in the classroom.

With a total of 558 participants during the six events, CINSAM is thrilled with the success of this inaugural program and is excited about the impact it will have on northern Kentucky P-12 STEM education!

### CINSAM NIGHT – EARTH’S SYSTEMS
**SEPTEMBER 16, 2014**

CINSAM Night kicked off the 2014-2015 STEM Connections series with a program dedicated to “Earth’s Systems.” Northern Kentucky University welcomed 212 community members, including P-12 teachers, NKU pre-service teachers, local business leaders and NKU administration, to campus for this event. Steve Horstmeyer, Chief Meteorologist with WXIX TV FOX19, delivered the keynote. Teachers were able to choose from eighteen unique PD sessions covering earth science standards from Early Childhood to 12th grade.

### START YOUR STEM ENGINES
**OCTOBER 21, 2014**

This STEM Connections program brought the topics of “Motion & Stability” and “Forces & Interactions” to life for 70 local P-12 teachers and NKU pre-service teachers. The night kicked off with a keynote address given by NKU’s own Norse Baja Buggy Club. Current NKU students and members of the Baja Buggy Club, Karen Ely and Tyler Spaeth, spoke to the participants during the keynote address. Following the keynote, participants attended two PD sessions, choosing from fifteen available sessions on subtopics such as engineering design and materials engineering.

### WILD ABOUT STEM
**NOVEMBER 19, 2014**

On this night, 136 local teachers and pre-service teachers had the opportunity to hear Thane Maynard, Director of the Cincinnati Zoo, speak about “Ecosystems.” CINSAM offered 14 unique sessions for teachers, including one presented by Dan Dunlap, Education Program Manager for the WAVE Foundation at the Newport Aquarium. The session topics ranged from environmental science and ecology to physics and engineering.
“Energy & Waves” was the topic of the first STEM Connections program in 2015. One of the original engineers of The Beast and manager of Facilities, Engineers, and Construction at Kings Island, Jeff Gramke, spoke to the 57 participants during the keynote. The fourteen PD sessions offered covered subtopics ranging from cybersecurity to chemistry and physics.

Joanna Haas, Executive Director of the Kentucky Science Center, gave the keynote address at our March STEM Connections program focused on “Matter.” Following the keynote, 41 P-12 teachers and pre-service teachers each participated in 2 PD sessions, chosen from 10 sessions covering a variety of lessons including the Chemistry of Fireworks and materials & nuclear engineering activities.

CINSAM closed the 2014-2015 STEM Connections series with a night dedicated to “Earth’s place in the universe.” The keynote address, delivered via SKYPE, was given by Marilé Colón-Robles, Professional Development Specialist at the NASA Langley Research Center. The event was attended by 42 P-12 and pre-service teachers. The ten PD sessions covered a number of subtopics in engineering and earth science, and included two sessions facilitated by the keynote speaker, Marilé Colón-Robles. Ms. Colón-Robles conducted both session via SKYPE and was assisted by CINSAM staff in the room.
The Next Generation STEM Classroom (ngSC) project is a STEM professional development program developed by CINSAM Outreach Director, Reeda Hart. Piloted during the 2012-2013 school year in Boone and Kenton counties, the program proved to be so successful that CINSAM was awarded a $560,000 gift from the Toyota USA Foundation in 2013 to support its expansion. This gift, along with three Senate Bill 1 grants, not only allowed for the hiring of two Outreach Specialists, Carrie Holloway (2013) and Lila Brindley (2014) and pays for substitute teachers, travel, and supplies, but it also enabled ngSC to expand into 19 school districts during the 2014-2015 school year!

ngSC

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The ngSC project places CINSAM’s outreach team in participating schools throughout the school year for a two-part professional development session. The first part of the session is referred to as the “Fishbowl.” During the “Fishbowl,” the CINSAM outreach team models best practices by teaching a standards-based STEM lesson to a class of students as teachers from multiple grade levels observe from inside the classroom. After the lesson, the teachers and CINSAM staff go to another room for the second part of the session known as the “Reflection and Exploration of Content, Alignment, and Pedagogy” or “RECAP.” The participating teachers and administrators are then tasked with taking the lessons back to their schools to share with their students and fellow teachers. CINSAM provides all participants with lesson plans, videos and additional resources.

In addition to the dramatic expansion of ngSC across 19 districts, another component was added to include NKU’s own pre-service teachers who are enrolled in either Teaching Elementary School Science or Teaching Science in Secondary School. By partnering with the professors of these two courses – Dr. Patti Bills and Dr. Kimberley Yates – CINSAM has been able to reserve five seats in each “Fishbowl” + “RECAP” session. By bringing together people with a range of experiences and ideas, both the pre-service teachers and the in-service teachers benefitted from this arrangement.
The CINSAM Southern Outreach Science Project has taken place in Augusta Independent Schools, St. Augustine School, Bracken County Schools, Pendleton County Schools, Williamstown Independent schools, Grant County Schools, and Gallatin County Schools for the past 11 years. Robertson County was added in 2013-2014.

The CINSAM outreach team – Reeda Hart, Carrie Holloway, and Lila Brindley – worked with teachers in grades four through eight to increase the number of teachers using best practices in STEM teaching, provides evidence of the teacher’s increasing science content knowledge, and has teachers reflect on their own teaching to identify the effectiveness of their teaching practices. While modeling for teachers, student goals are also apparent. Through experiencing the activities and learning the content, students will become excited about STEM and STEM careers!

In 2014-2015, these goals were accomplished by:

• Two days this school year modeling best practices in each science classroom with the teachers’ students in grade 4 through 8. Allowing teachers to choose the subject of each visit is a unique feature of the Southern Outreach Program. That way the subject of the visit is embedded in what is being taught. It is not a diversion from what the students are studying.

• Providing a flash drive of science resources for teachers, including lesson plans following the 5 E Inquiry Model, hands-on labs, and Power Points that address science content.

SPECIAL PROJECTS
Presentations at state, regional, and national conferences:
• Kentucky Science Teachers Association (Lexington, KY)
• Kentucky Association for Environmental Education (Lexington, KY)
• National Science Teachers Association (Chicago, IL)
• Association for Science Teacher Education (Portland, OR)
• University of Cincinnati STEM Conference (Cincinnati, OH)

COMMUNITY OUTREACH
• Family Science Night at New Haven Elementary (Boone County)
• Pendleton County Summer Academy
• Provided training for NKU’s Early Childhood Center student leaders
• Guest lectured for NKU’s Teacher Education courses
• Science Night with Dad at Erpenbeck Elementary (Boone County)
ELEMENTARY STEM DAYS
This year more than 300 fourth grade students and their teachers visited NKU’s campus for hands-on activities at Elementary STEM Days! Students from Ludlow, Florence, Goodridge and Mann Elementary Schools attended.

NKU’s pre-service teachers prepared small science lessons as part of the EDU 308 course with Dr. Patricia Bills. They practiced these sessions with the students at Elementary STEM Day.

While half of the students were rotating sessions with pre-service teachers, the other half were attending sessions with NKU faculty and staff. Topics included physics, chemistry, environmental science, biology, computer science, and more!

CLUB 21
Beth Russell, CINSAM Program Manager, guided 7th grade students in a cybersecurity activity and explored NOVA’s Cybersecurity Lab. They participated in introductory coding, password, and social engineering challenges that taught students to recognize websites, emails, and phone calls that are not safe.

Delta GEMS Campus STEM Days
The Delta GEMS are a group of high school age African American women who enjoyed a day of learning about cyber security, STEM disciplines, careers, and opportunities at NKU with CINSAM’s Beth Russell, Thomas Brackman, Danielle Cirelli and other NKU faculty and staff.

Hearts & Minds
Hearts and Minds is a science, math, and leadership program for black male students throughout the Greater Cincinnati area. Kevin Robertson, WLWT News 5 chief meteorologist leads the mentorship program. The event allowed the students and their parents to travel to NKU for a day to work with our STEM and CINSAM faculty and talk with NKU students.

Tech Day at 21st Century Learning Center
CINSAM staff, Lila Brindley and Beth Russell engaged 1st-8th grade students from 21st Century Learning Center in 3 laser maze sessions.

Black Data Professionals Association High School Computer Camp
CINSAM provided financial support for the thirty-one week program in which African-American middle and high school students learn about computers and information technology. Participants in the camp compete against other teams from BDPA chapters across the country; the team from Cincinnati placed 5th in the country in 2014.

John O’Bryan Mathematics Competition
CINSAM provided financial support to this regional high school mathematics competition.

Mathcounts Regional Mathematics Competition
CINSAM provided financial support to this middle school competition that leads into state and national competitions.

Kentucky Science Center Youth Science Summit
On October 4, 2014, CINSAM hosted the Northern Kentucky Youth Science Summit, presented by the Kentucky Science Center.

First® LEGO League
This year, CINSAM hosted both the Northern Kentucky Regional and the Kentucky State Tournaments for FIRST® LEGO League. The regional was held in December and included the Junior FIRST Lego League Engineering Expo. Multiple teams won trophies in different competition areas, and ten teams progressed to the state competition.

NKU also became the Kentucky State Affiliate Partner for FLL this year. For the first time, the top 48 teams from across Kentucky came to campus to compete for state-level recognition.

Teams designed, built, and programmed LEGO robots to complete up to 25 missions on a predesigned robot performance field. Teams were judged on teamwork, research presentation, and robot design and programming.
RESEARCH GRANTS

John Carmen, Biological Sciences – Identification of genes required for thermal adaptation and virulence in thermally dimorphic fungi using subtractive genome analysis and RNA-sequencing
The main focus of Dr. Carmen’s CINSAM funded research is to identify DNA sequences which are found in dimorphic fungi like Blastomyces dermatitidis, and not in fungi like Saccharomyces cerevisiae and Aspergillus fumigatus which cannot change from yeast to mold and do not cause life-threatening infections in health individuals. Working with NKU students Stephanie Gehrlich, Kayla Smith, and Deborah Burgess, the Carmen research team is using in silico subtractive genome hybridization to determine genome similarity between B. dermatitidis and another organism’s DNA, and analyzing the results to uncover which sequences are used to make gene transcripts. To date, they have developed new software to perform a portion of the in silico process, completed the computational comparison of dimorphic fungi genomes, and are currently analyzing the results of the subtractive genome hybridization.

Charlisa Daniels, Chemistry – Characterization of tunable polymeric materials
CINSAM funds allowed the Daniels research group to have a fruitful first summer. Their research focuses on the synthesis and characterization of porous polymer monoliths that respond, or change, as a function of external stimuli. This summer Dr. Daniels, along with two NKU students (Andres Gasper and Ben Cecil) were able to synthesize a wide range of polymers, both externally responsive and inert. They use a variety of instrumentation to characterize the polymer monolith. We were able to obtain Scanning Electron Microscopy (SEM) images of our synthesized polymers, as well as gather preliminary data via Capillary Electrophoresis and Ultra Performance Liquid Chromatography.

Isabelle Lagadic, Chemistry – Microwaved-assisted synthesis of polymer-clay nanocomposites by surface-initiated polymerization from one-step organoclays
Funded by a CINSAM research grant, the Lagadic research group focused on optimizing the synthetic pathways of organoclay-polymer nanocomposites, materials that exhibit enhanced mechanical properties, corrosion resistance, inflammability, and antimicrobial activity, making them attractive materials in aerospace, automotive, and biomedical applications, among others. Dr. Lagadic worked with two students, Travis Schuyler (NKU chemistry major) and Maël Coeurdray (intern from Institute Universitaire de Technologie de Lannion-France), on this project. Following the characterization of polystyrene-organoclay composites, it was found that 1) a mixture of polar and non-polar solvent resulted in a high content of grafted polystyrene, 2) this grafting occurred within the first 30 minutes of the reaction, and 3) incorporation of the composites into polystyrene did not significantly alter optical transparency and hydrophobicity of the pure polystyrene. These preliminary results confirm possible application of these composites in polymeric matrices. This study also involved collaborative work with Wright State University.

Celeste Morris, Chemistry – Rapid detection of thyroid hormones in blood serum
Dr. Celeste Morris utilized CINSAM research funds to develop sensor technology for the rapid detection of thyroid hormones in blood serum. Working with NKU students, two detection schemes were tested: 1) detection of T2 and T4 across a water/1,2-dichloroethane interface to determine the appropriate voltage required for detection and 2) development of a robust solid-state carbon nanopipette electrode for T3 and T4 detection. This technology will allow healthcare providers to analyze blood and access the data immediately, as opposed to waiting for laboratory analysis, which often takes several days.

Joseph Mester, Biological Sciences & Amber Onorato, Chemistry – Synthesis and activity of novel diarylheptanoids
The renewal of their CINSAM grant allowed Dr. Mester and Dr. Onorato to continue their research into the synthesis and anti-inflammatory activity of novel diarylheptanoids (DAH). Working with several undergraduates (Leena Ibrahim, Richard McLane, Maxwell Boyle and Jacob Telesz), they have made progress towards the synthesis of novel DAH analogues, determined the
dosage range appropriate for testing, and identified unique targets and mechanisms for their role in inhibiting the inflammatory response. Additionally, a collaboration was developed with Dr. Michael Tranter at the University of Cincinnati College of Medicine. The results of this research will contribute to the design of future anti-inflammatory agents for treating chronic inflammation.

Kirsten Schwarz, Biological Sciences & Michele Day, Communication – A transdisciplinary exploration of environment
Using the CINSAM research grant, Dr. Schwarz, Dr. Day and four NKU undergraduates from the Department of Biological Sciences (Emily Keener, Beth Knox) and the Department of Communications (Kevin Schultz, Sydney Smith) collaborated on a transdisciplinary study aimed at determining lead levels in soil sampled from a neighborhood immediately adjacent to a local former lead smelting site in Newport, KY. This study is a follow up to a USA Today report indicating the presence of elevated lead levels in soil surrounding sites with a history of lead smelting. The preliminary results of the study have shown all sampled areas have soil lead levels that exceed the EPA guidelines for both children’s play areas and urban gardening; however, the exact source of the lead has not been determined. Neighborhood leaders, public officials and scientists have also been interviewed at the community, state, and national levels. The students involved in this study have produced compelling pieces of science communication, including a piece submitted for publication to a local news organization and will be presenting the results of this study at the Ecological Society of America meeting in August 2015.

Emily Shifley, Biological Sciences – Investigating the role of FGF signaling in the embryonic pharynx
Dr. Shifley used her CINSAM grant to support two undergraduates this summer, Sarah Kunkler and LeighAnn VanDyke. Both students have worked this summer manipulating a genetic signaling pathway called FGF in developing Xenopus embryos and have found some changes in gene expression patterns in the embryos. Their preliminary results will help us start to understand which genes are important for the development of organs from a structure in the embryo called the pharynx.

Erin Strome, Biological Sciences – Developing high throughput methods to identify genes involved in cancer incidence
Dr. Strome utilized her CINSAM research grant to make significant progress on the initially proposed project, as well as to expand the scope of the study to include two additional projects that are contributing to further progress and growth of the original project. The project goal is to develop a unique experimental setup that allows for the screening of all genes in the genome for their impact on cellular aneuploidy – an indication of cancer development. Working with Elizabeth Hensley, Kellyn Hoffert, Mike Carroway, and Collin Johnson, all NKU students, Dr. Strome has copied the complete Saccharomyces cerevisiae deletion collection (SCDC), established a new protocol for developing haploid strains resulting in the development of haploid strain able to reproduce more quickly, begun determining variables to be used in future high throughput screenings, and developing the programming skills needed to analyze sequence data.
UNDERGRADUATE RESEARCH

HEATHER BULLEN INTERDISCIPLINARY SUMMER RESEARCH CELEBRATION & MEMORIAL AWARD

This celebration and award is in honor of Dr. Heather Bullen, a tenured analytical chemist who joined NKU in 2004. She had an infectious smile and positive attitude that affected all who interacted with her. Her legacy lives on in her family, friends, students, and colleagues.

After her passing, a scholarship was set up in her name to reward first generation college students majoring in STEM for their leadership and academic efforts at NKU. Students are nominated by faculty each spring and the award is presented at the end of the academic year. Nominees and winners are honored at the Heather Bullen Interdisciplinary Summer Research Celebration, held each year in August.

This year, four students were recognized:
Award Winner: Jonathan Webster (Biology)
Nominees: Calvin McLain (Computer Science), Nolan Boone (Mathematics), Juan Maldonado (Physics)

In all, the Heather Bullen Interdisciplinary Summer Research Celebration, held on August 27, 2014, welcomed over 400 people, including student presenters, to recognize and celebrate the STEM research that was conducted by NKU students over the summer.

In addition to hosting the Celebration, CINSAM also provides financial support for students conducting research over the summer to assist with lodging.

CELEBRATION OF STUDENT RESEARCH AND CREATIVITY
CINSAM, along with the NKU Research Foundation, sponsor NKU’s Celebration of Student Research and Creativity, a week-long event showcasing the scholarly work of NKU students. During Celebration, both undergraduate and graduate students across all disciplines, not only STEM, present research, artistic, or creative projects. This event provides important recognition and acknowledgements of the excellent work and accomplishments of NKU students.
SEMINAR SERIES

Launched in 2013, CINSAM’s Seminar Series features presentations of NKU faculty and student research focused on a central theme. This year, the theme was “Transdisciplinarity in Action” and presentations focused on the integration and collaboration of NKU’s colleges and departments. Over 50 faculty/staff and 40 students attended the six seminars. Some students received Leadership University credit for attending.

FALL 2014
September 10: Andrew Long (Mathematics and Statistics) presented “Planetary Emergence: the Carbon Crisis Across the Curriculum.” His presentation focused on aspects of global climate destabilizations observed across divisions of the university and called for transdisciplinary action to address this issue.

October 8: Speakers from Computer Science (Nathaniel Hudson, Maureen Doyle), Mathematics & Statistics (Kacie Kotnik, Joseph Nolan), Biological Sciences (Kristi Haik), CINSAM (Madhura Kulkarni), and the Kentucky Center for Mathematics (Pam Reichelderfer) presented “A Transdisciplinary Approach to Examining Undergraduate Retention at NKU.” The results of an on-going investigation of student retention and movement among departments was presented.

November 12: “Project EMBRACE: Exploring Musical Boundaries, Relationships, and Artistry in Composition and the Environment” was presented by Amy Gillingham and Holly Atar from the Department of Music.

Their talk centered on the NKU String Project, a program that brought NKU undergraduates together with local children to teach them musical composition through an environmental lens. Students wrote and performed works inspired by nature. A small group of NKU String Project students also performed.

SPRING 2015
February 18: This seminar was cancelled due to inclement weather and was not rescheduled. The scheduled talk was “Transdisciplinary Scholarship Through ESI: NKU’s Ecological Stewardship Institute” presented by faculty and students from the Departments of Biological Sciences, Visual Arts, and the Ecological Stewardship Institute (ESI)

March 18: “Mapping Honeysuckle Spatial Distribution by Using High-Resolution Remote Sensing Techniques – A Case Study in Middle Creek Watershed, Boone County, KY” was presented by faculty and students in the Departments of Computer Science (Hongmei Wang, Spencer Taylor), Biological Science (Sara Giles, Katherine Ollier), History & Geology (Matthew Dornbush), Geography (Robert Kellison), and Anthropology, Sociology & Philosophy (Tyler Scranton). The study explored the process of evaluating honeysuckle distribution in northern Kentucky using remote sensing technologies. The results of this study are important for understanding the status of wildlife habitats and for implementing site-specific management in parks and nature preserves.

April 8: “Project Hope: A Transdisciplinary service learning and community engagement project” was presented at the last seminar of the 2014-2015 year. Speakers from the Departments of Psychological Science (Rachel Clark, Bobbie Stubbeman), Social Work (Jessica Taylor, Faye Perkins, Hannah Powers), as well as the Honors Program (Belle Zembrodt) and the Scripps Howard Center for Civic Engagement (Mark Neikirk) talked about an initiative of the Greater Cincinnati Service Learning Network – Project Hope. Psychology students measured hope and meaning in life in residence; social work students studied philanthropy by awarding grants to organizations; and Honors students collaborated with neighborhood associations to increase well being.
In fall 2014 and spring 2015, CINSAM offered six sections of Integrative Natural Sciences (SCI 110) and Honors Integrative Natural Sciences (SCI 110H). These four-credit courses enrolled students from across the university and are designed to engage students from all majors – especially those who major in Education – in their own learning process by using inquiry-based course design. Students learned important principles of biology, chemistry, physics, earth science, and mathematics and the connections among disciplines; they also practiced the scientific method in order to uncover these principles via their own discovery process, just as professional scientists do. Further, students learned about mathematics as the language of science employing mathematical models and statistics to describe relationship and patterns in the data they analyzed.

The course was designed to promote NKU and CINSAM’s learner-focused classroom environment and was therefore conducted in a “studio” style – with professors circulating in the room as students conducted their own “hands-on” and “minds-on” experiments – rather than the traditional lecturer-focused classroom style. This environment not only fostered greater interest in and ownership of the students’ learning, but also trained pre-service teachers in creating the sort of learning environment for their own future students that is favored by an increasingly robust body of research. As such, this course started with identification and explanation of Student Learning Targets, which were:

- Students will learn how scientific activity is conducted and will engage in conducting experiments.
- Students will understand major scientific ideas – many of which they will experimentally discover.
- Students will learn how scientific discovery crosses disciplinary borders.
- Students will have an increased awareness of current scientific issues and the importance of scientific literacy to understanding and resolving issues.
- Students will use mathematics and mathematical relationships to analyze data and solve problems using their data and/or other information.

INSTRUCTORS
In order to showcase the true integrative nature of science and mathematics, instructors from different STEM disciplines lead the course. This year, the course was instructed by:

SARAH BECKMAN
RICK BULLARD
BILL SCHNEIDER
JENNIFER MYKA
MIKE DESANTIS
VERN HICKS
SCHOLARSHIPS, BUGGY TEAM & WORKSHOPS

CINSAM SCHOLARSHIPS
CINSAM Scholars are undergraduate students who have been awarded funding by CINSAM to pursue STEM and STEM Teaching majors. CINSAM college faculty select scholarship recipients based on overall academic performance, strong showing in mathematics and the sciences, and plans to continue their studies in these fields. Scholarships help pay for tuition, books, and/or housing for these excellent students.

During the 2014-2015 school year, CINSAM funded 32 CINSAM Scholars. Scholars are enrolled in all three of the CINSAM colleges and have majors including Biological Sciences, Chemistry, Computer Science, Computer Information Technology, Engineering, Mathematics, Mathematics Education, Physics, and Teacher Education.

In addition, CINSAM coordinates the Greaves Endowed Scholarships for STEM majors. This year, 20 students from across the STEM departments were supported by these scholarships that provide in-state tuition and books.

NORSE BAJA BUGGY TEAM
For the second year, CINSAM supported the Norse Baja Buggy Team. The team designs and builds a new Baja Buggy to exacting standards each year, then races it in national competitions. These students embrace and implement the integrative STEM approach that CINSAM works to promote, utilizing knowledge and skills from various fields in the design and building process.

TEACHER WORKSHOPS & FELLOWSHIPS
Building unit plans for middle school teachers on the Next Generation Science Standards in Physical Science and Engineering – Led by John Filaseta (NKU), Dave Ledden, and Tim Schneider (Campbell County Schools), this workshop provided local middle school teachers with five days of professional development on NGSS for physical science and engineering. The teachers participating not only built on their understanding of NGSS and NGSS Assessment, but also worked in groups to develop several unit plans addressing the relevant NGSS topics and engineering design, learned about building project-based learning units, and addressed knowledge content concerns.

Math Teachers’ Circle – NKU Mathematics & Statistics faculty, Lisa Holden and Aimee Krug, teamed up with two Highlands Middle School math teachers (Kathy Donelan and Jill Terlau) and the Assistant Superintendent for Teaching and Learning for Fort Thomas Independent Schools (Ginger Webb), to deliver an intensive problem solving workshop for middle grades mathematics teachers. This is the first Math Teachers’ Circle in Kentucky that connects mathematicians and mathematical scientists with teachers. Over the week, more than 20 math teachers from nine local school districts came together to learn through games, puzzles, and hands-on activities. The group plans to continue to meet throughout the school year during CINSAM’s STEM Connections professional development workshops.

Summer Research Fellowship in Microbiology and Bioinformatics for High School and Middle School Teachers: Searching for New Antibiotics and Genes Related to Fungal Pathogenesis – Department of Biological Sciences faculty member, Dr. John Carmen, led CINSAM’s first Summer Research Fellowship. Sara Anderson, a biomedical teacher at the Kenton County Academics of Innovation and Technology, worked with Dr. Carmen to find new antimicrobial compounds and genes associated with fungal pathogenesis and to design curriculum for her classroom. Initial results from her research suggest that three separate compounds were found in the soil samples used: Bacillus thuringiensis or B. cereus, Pseudomonas chlororaphis ss auratiaca, and Pseudomonas aeruginosa. These results still need to be verified. Based on the project and techniques she masters during this fellowship, Ms. Anderson has developed an NGSS-based curriculum that will be used in her classes. This experience also led to the development of an internship in Dr. Carman’s lab for high school students from the Kenton County Academies of Innovation and Technology.

“The good news is that we just finished the math circle workshop last week and I learned more in one week than I have from all other PD’s I have ever attended, combined.” – Aaron Lense, Math Teacher, Highlands Middle School
With funding from Ashland, Inc., CINSAM offered thirteen unique and engaging summer camps for 3rd-12th grade students.

**Explore STEM!**  
(July 13-17, 2015)  
Led by NKU professor Dr. Bethany Bowling, Explore STEM! gave 24 6th-8th grade students the opportunity to conduct experiments, learn technologies, and utilize equipment frequently reserved for upper-division STEM majors. Topics included geology, chemistry, biotechnology, computer science and more!

**A Week of Mathematical Marvels!**  
(July 20-24, 2015)  
25 6th-8th grade campers, spent the week with Dr. Brooke Buckley (NKU Department of Mathematics & Statistics) exploring fun topics such as contagious yawning, origami, and finding out how many Mentos it takes to make a diet soda fountain. All of the hands-on activities were designed to show students the relevance of algebra, geometry, and statistics to real-world problems.

**Java Game Programming**  
(June 8, 2015-July 8, 2015)  
Dr. Richard Fox, professor in the Department of Computer Science, led 18 8th-12th students in Java Game Programming, also known as the NKU Computer Science Scholars Workshop. The campers spent four and a half weeks this summer learning to code in Java and writing one or more computer programs. The last week of camp was spent producing large scale computer games that were presented to family and students.

**Mobile Game App Development**  
(June 8-26, 2015)  
This three-week camp, led by Dr. Wei Hao of the NKU Department of Computer Science, guided 18 7th-12th grade students through the basic principles of mobile and visual programming and how to design and implement mobile apps using App Inventor. Android tablets were provided for students to develop and test their mobile apps and during the last week, campers worked in groups to develop mobile game apps that were presented on the final day.

**Rock-It with Rockets!!**  
(June 22-26, 2015 & July 6-10, 2015)  
Rock-It with Rockets!!, headed by CINSAM’s own Carrie Holloway (Outreach Specialist), was offered twice this summer, giving 46 rising 3rd-5th graders a chance to experience science and engineering while designing and testing various types of DIY rockets. Putting their math skills
to the test, campers determined the best design for a model rocket and spent the last day of camp launching them on NKU’s campus. Campers also attended a show at NKU’s Haile Planetarium entitled “Cardboard Rocket.”

**Mission to the Moon**  
*July 13-17, 2015*  
Designed for rising 3rd-5th graders who had already completed the Rock-It with Rockets!! camp and led by Carrie Holloway (CINSAM Outreach Specialist), Mission to the Moon gave twenty-four campers a chance to design, test and launch rockets, as well as complete an engineering challenge by building a moon buggy out of Legos. Campers learned about data collection and analysis, the engineering design process, and the scientific ideas around forces and motion. The camp kicked off with a show at NKU’s Haile Planetarium about the Google Lunar XPRIZE contest.

**STEM Girls: Transforming the World**  
*June 22-26, 2015*  
Sponsored by NKU’s CINSAM, funded by the Ashland Foundation, and led by members of the Kentucky Girls STEM Collaborative and the Greater Cincinnati STEM Collaborative, STEM Girls: Transforming the World gave 24 9th and 10th grade girls a glimpse into what they can do to change the world using science, technology, engineering and math. Campers were introduced to real-world issues and had the opportunity to meet with experts on matters such as food security, water quality, and bridge safety. They were even given the chance to come up with their own solutions to some of the issues presented.

**Robotic Space Challenge**  
*June 8-19, 2015 & July 13-24, 2015*  
32 6th-8th grade Campers spent two weeks with NKU Computer Science lecturer, Teresa Riley, and Florence Elementary School teacher, Beth Koch. They worked as scientists and engineers to explore the real-world topic of traveling to and living on Mars. Campers participated in a variety of activities including programming, building robots, and research projects on current topics that NASA engineers and scientists are working to address.

**Aeronautics (June 23-25) & Aero-Girls! (June 9-11)**  
These four-day camps, directed by Bill Schneider, Tom Edwards, and Jim Daniels, were designed to explore the physics and mathematics of planning and piloting a flight on a (simulated) Cessna 172. In total, 39 6th-10th grade students participated in the camps. During the experience, participants used the Microsoft Flight Simulator system to design, plan, and conduct a flight between Kentucky airports. Campers also had the opportunity to take an optional tour of Lunken Field at the Cincinnati Municipal Airport.

**What can YOU Engineer?**  
*July 6-10, 2015*  
The 19 9th-12th grade students who participated in What can YOU engineer? spent the week with Dr. Morteza Sadat-Hosseiny, NKU Engineering Technology professor, exploring computer modeling, rapid prototyping, robotic construction and CNC plasma cutting. They had the opportunity to team up with experienced engineers during two field trips to local companies and learn how they approach and solve different types of engineering problems. They also worked with NKU faculty and students to utilize the NKU engineering technology facilities.

**Astronomy (July 6-10, 2015) & Advanced Astronomy (July 13-17, 2015)**  
Led by the Director of the NKU Haile Planetarium, Dr. Dan Spence, these week-long camps introduced 36 6th-8th grade campers to astronomy. Students also had the opportunity to see a different program at NKU’s Haile Planetarium each day. Campers enrolled in Advanced Astronomy also participated in activities that involved learning and teaching in the planetarium. They receive hands-on instruction in using the planetarium and computer for research. On the last day of the camp, students in both camps presented to friends and families using a Kinect to control their presentations.

**Latino and English Language Learners Fun with Science**  
*July 27-31, 2015*  
Dr. Miriam Kannan, NKU Department of Biological Sciences, hosted 22 Latino and English Language Learners for a week of discovery and fun with science. Assisted by six additional NKU faculty members, Dr. Kannan led the students on numerous hands-on activities and field trips, including a River Adventure Cruise, visits to Proctor & Gamble and the Haile Planetarium, and experiments in microbiology, physics & geology. The students were presented with awards and diplomas on the last day of camp.
What type of compost makes the best soil?  
Does the diameter of a water wheel effect how much electrical current can be produced?  
How does the angle of inclination affect model airplane propellers?  
Can titanium dioxide nanoparticles enhance desalination?

This year, a bout of severe winter weather caused CINSAM to cancel the scheduled 2015 Science and Engineering Fair of Northern Kentucky (SEFNK), originally set for February 21. In its place, the High School division was rescheduled to Sunday, March 1, while the Elementary and Middle School division participants competed in an online fair held between March 8-16.

Twenty-three high school students came to NKU for the rescheduled competition and 139 4th-8th graders competed in the online fair; all of the students were the winners from local and school science fairs from over 40 schools in northeastern Kentucky. They were competing for spots at the state competition in Richmond, KY on March 27, 2015. Cassidy Ryan, a senior from Notre Dame Academy, won the grand prize at SEFNK with her project entitled “Bioassay determination of environmentally safe levels of atenolol, carbamazepine, and ibuprofen in waterways.” She received an all-expense paid trip to the International Science and Engineering Fair (ISEF) in Pittsburgh, PA in May 2015.

CINSAM’s Program Manager, Beth Russell directed the fair with support from the board of directors of SEFNK’s 501(c)3 corporation. CINSAM continued its sponsorship of the event for the nineteenth consecutive year, with CINSAM personnel serving as judges and volunteers.
SOAR

Project SOAR: Scholarships, Opportunities, Achievements & Results seeks to recruit, retain, educate, and graduate academically talented students with financial need – SOAR Scholars – who will enter the workforce or graduate school in a STEM field. We currently have 61 SOAR Scholars and 10 CINSAM Scholars in the SOAR Program and will welcome 26 SOAR Scholars and 4 CINSAM Scholars to NKU in Fall 2015. Achievements include:

- Higher freshmen retention rates for SOAR Scholars (>89%) than their STEM peers (74%); freshmen year retention rates within STEM for SOAR Scholars is 82% compared to 74% of all first year STEM majors.
- 2014 SOAR Scholars average GPA 48% higher than peers at the end of the freshman year.
- Robust number of under-represented Scholars participating in Project SOAR each year (7, 10, 11, 14, 11, 7 Scholars per year, respectively), with an increase in the diversity of our cohorts over the last 3 years to include students of African American, Hispanic, and native Hawaiian Islander descent.
- Increased SOAR Scholar participation in summer research (33%) when compared to other STEM students (<20%) following their freshman year.
- Increasing number of SOAR Scholars engaged in internships & Co-Ops (11 in 2014-15).
- More frequent and improved performance reviews (i.e., every 4 weeks instead of once a semester) so students have time to implement any changes needed to improve success in their classes.
- 4-year graduation rate for SOAR 2009 is 47%; for SOAR 2010 it is 35% and for SOAR 2012 it is 68% compared to 17% of their peers.

Project SOAR is supported by the National Science Foundation under Grant No. 1154290, NKU and CINSAM.

MARISA DERENZO
Biology (Pre-Veterinarian) major and chemistry minor,

Marisa Derenzo has been involved in STEM since her first day at NKU. Along with being a SOAR Scholar, she is also a member of the Tri Beta Biological Science Club and the Health Professions Club – both student organizations that are sponsored by Department of Biological Sciences faculty. She has also been involved in undergraduate research since her freshman year.

She began her research experience with Dr. Richard Durtsche studying an introduced lizard species new to the northern Kentucky region. She presented this research at the Kentucky Academy of Science meeting November 2014 and at the Spring 2015 NKU Celebration of Undergraduate Student Research and Creativity. Marisa also received a NSF International Research Experience for Students grant to help fund her participation in a second project working in Belize with Dr. Charles Acosta and Dr. Gail Mackin. While in Belize, Marisa studied the dispersal rates of two commercially valuable marine species – the Spiny Lobster and Queen Conch. This research will be presented at a research conference Fall 2015.

“SOAR has made my NKU experience the best that it could be and I am so thankful for it!”

SOAR
FORCE

Project FORCE (Focus on Occupations, Recruiting, Community, and Engagement) was awarded $999,930 through the National Science Foundation (NSF) STEP Type 1a program to build coordinated efforts in recruitment and retention across the science, technology, (pre-)engineering, and mathematics (STEM) disciplines at NKU. The project began in May of 2010 and involves the departments of Biological Sciences, Chemistry, Computer Science, Mathematics & Statistics, and Physics & Geology. Since the project began, significant gains have been made in recruitment and retention of NKU students, including:

• 49.7% increase in the number of STEM degrees conferred to a four-year average of 219, exceeding our goal of 180.
• 27.7% increase in the number of students enrolled in the STEM disciplines
• 31% increase in the number of underrepresented students enrolled in STEM disciplines
• Over 1500 NKU students have participated in Project FORCE initiatives including undergraduate research, peer-led study sessions for challenging courses, and social activities such as the monthly STEM pizza suppers
• Students that participate in FORCE activities are much more likely to continue as a STEM major (80% retention over 4 years, compared to 20% for non-participants)
• Over 190 students have been funded to conduct research with a faculty member through our UR-STEM program which focuses on 1st - and 2nd -year students
• Increased participation in peer-led study sessions for challenging STEM courses led by experienced STEM Ambassadors (over 250 students attended sessions in 2014-15)
• Continued aggressive recruitment that include mailings to potential high school applicants each fall and a STEM Showcase in which students and their parents learn more about NKU STEM program and scholarship opportunities

NATHAN DASENBROCK-GAMMON-
Physics and Mathematics Major

Nathan Dasenbrock-Gammon is a junior at NKU, double majoring in Physics and Mathematics with a minor in Chemistry. He has fully embraced the STEM community at NKU and currently serves as a STEM Ambassador, a calculus and statistics tutor, a SOAR tutor, and a Lab Assistant for STA 205. He is also a member of Alpha Phi Omega, the Mathematics & Statistics club, as well as the Physics & Engineering club.

Through FORCE, he has helped plan and host social events for the NKU STEM community including bonfires, trivia night, and the STEM Olympics. FORCE also gave him the opportunity to begin conducting research through the UR-STEM program his first summer at NKU, which has led to additional research opportunities, a poster presentation at the Joint Mathematics Meeting in January 2015, and the submission of a manuscript.

“I love being a part of the NKU STEM community and getting to connect with other STEM students, so I applied to be a STEM Ambassador my second year at NKU. Through this experience, I have grown a lot, become a much stronger leader, and more confident person.”
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