

NC STATE UNIVERSITY

The
Science
House

Annual Report

July 1, 2017 – June 30, 2018

The Science House is critical in NC State's efforts to recruit and retain a critical mass of diversity representation in students, faculty and staff so the campus community better represents the people served by NC State. All five university strategic goals are addressed by the university's commitment to outreach and service and specifically to monitoring and improving efforts to increase the recruitment, application and yield of underrepresented undergraduate students.

The Science House reached over 6,000 teachers and 224,000 students through its many teacher and student programs.

Highlights from this year for The Science House include:

- Over 98% of teachers attending Science House **Professional Development Programs** agree or strongly agree that they are satisfied with the workshops. 96% of those same teachers agree or strongly agree that they plan to implement what they learned in the workshop in their classrooms. 95% of those same teachers agree or strongly agree that they would recommend the workshop to their colleagues.
- Over 19,000 students and 400 teachers utilized the rural-focused **Equipment Loan Program** during the 2017-2018 school year.
- 15 of the 18 school systems served by the **Mountain Satellite Office** are designated as either Tier 1 or Tier 2 by the North Carolina Department of Commerce. This identifies the Mountain service area as an area of high need for the rural and underserved population of NC. The Mountain Satellite Office served over 44,000 students and 1300 teachers/administrators during the 2017-18 school year.
- The **Mountain Satellite Office** organized and facilitated the 5th Annual ESTEAM Conference for 200 seventh grade girls and boys from the most rural and underserved counties of the Mountain Satellite Office service area. For the past 5 years, all 8 systems served by ESTEAM continued to advocate for funding for the program to the Cherokee Preservation Foundation because they felt the conference supported more students to pursue STEM and enhance STEM

education.

- The **Mountain Satellite Office** provided Sustained STEM Support that impacted 100% of the Native American population on the Qualla Boundary of the Cherokee. The office developed pacing guides and lesson plans for Grades 3-5 that integrated STEM into the curriculum while at the same time making it relevant to Native Americans focusing on cultural implications and where Native Americans would have cognitive disconnect.
- 100% of all school systems contracting with the **Mountain Satellite Office** for Sustained STEM Support have repeated their request, demonstrating that progress garnered through the initiative was deemed worthwhile by the system and worth continued investment.
- The **CMAST Satellite Office** became a GLOBE.gov partner which allows it to provide GLOBE workshops. Grade-specific workshops will be provided throughout the year to local rural school districts as well as to organizations such as the Camp Boddie Boy Scout Camp in Washington NC.
- The Coastal Carolina MATE ROV Competition was hosted by the **CMAST Satellite Office** for the second year in a row and boasted over 250 participants. Student teams from as far away as Asheville, NC traveled to participate in this growing underwater robot competition. Partners included Bistro By the Sea, Camp Albemarle, Marine Technologies, the Big Rock Tournament Foundation, and Cherry Point Marine Base. **CMAST Youth Programs** served over 1600 students this school year in Southeastern North Carolina.
- The **Northwest Satellite Office** conducted Professional Development entitled “Filling the Gap” for middle and high school teachers. Partnering with 16 local STEM businesses, over 30 teachers have created and implemented Project-Based Learning (PBL) units engaging 800+ students in real-world business problems/issues. This summer, this Professional Development will be repeated at the NW Office in Hickory as well as another session at Isothermal Community College in Rutherfordton, NC for Rutherford, McDowell, and Polk counties.
- The **Northwest Satellite Office** conducted GEMS (Girls Engaged in Math and Science) Clubs Coaches Training last summer for Catawba, Caldwell, Burke, Alexander, and Lincoln counties. So far, 25 clubs have been established across the WPCOG service area. Coaches received 4 days of training and \$200 for club supplies. This summer, that the Professional Development will be repeated at the NW Office in Hickory as well as another TPD session at Isothermal Community College in Rutherfordton, NC for Rutherford, McDowell, and Polk counties.
- Educational Researchers from NC State’s College of Education Dr. Audrey Jaeger, Katie Smith, and Dana Thomas performed a research student on the influence of the **NC Science Olympiad** and found the following key findings:

- 1,185 NC State undergraduates had listed their participation in the NC Science Olympiad on their college application, comprising at least 5% of the undergraduate student body.
 - NC State students who participated in NC Science Olympiad are much more likely than their non-Science Olympiad peers to pursue STEM majors at NC State (80% vs. 55%, respectively)
 - Women who participated in NC Science Olympiad are much more likely than their non-Science Olympiad female peers to pursue STEM majors at NC State (73% vs. 56%, respectively)
 - 49% of NC State undergraduates that participated in NC Science Olympiad said that Science Olympiad influenced their college choice of NC State
 - 45% of NC State undergraduates that participated in NC Science Olympiad said that Science Olympiad influenced their college major choice
- Since the **NC Science Olympiad** partnered with NC State and The Science House in 2006, teams have grown by 186%. Approximately 1,000 K-12 teams comprising over 18,000 students participated in NC Science Olympiad during the 2017-2018 School Year. Olympiad operated 36 tournaments across the state reaching schools in over 85 counties.
- **Kyran Anderson Academy** delivered 62 hours of integrated science, technology, engineering and mathematics programming to 90 students in 2017. 120 rising third-sixth grade students (54% female and 46% males) from seven counties in North Carolina: Wake, Durham, Chatham, Johnston, Orange, Hoke and Mecklenburg were selected to participate in the Bioscience: The Science of Me Session. School type representation of students are mainly from public schools (76%) including private (18%), charter (16%), and home schools (6%). Participants are mainly from Wake County (82%), followed by Durham (7%), and Johnston (6%). Ethnicities of participants are predominantly African American (82%) and Caucasian (6%). Jack and Jill of America Foundation, Incorporated, "The Science of Me" Proposal of \$6,000 was awarded to Kyran Anderson Academy. Kyran Anderson Academy programming has expanded from a one-week program serving 60 students to a two-week program serving 120 students.
- **Imhotep Academy** delivered 75 hours of science, technology, engineering and mathematics programming to 136 students during the 2017-2018 year. The academy reverted back to a fee-based model and served students from nine counties in North Carolina: Wake, Durham, Granville, Johnston, Orange, Hoke, and Chatham. School type representation are mainly from public schools (80%) including private (14%), charter (14%), and home schools (3%). Participants were mainly from Wake County (69%), followed by Durham (10%) and Johnston (8%). Females represented 48% of the participants. Participants were predominantly African American (60%) and Caucasian (7%). Grade level representation of students were (39%) sixth, (44%) seventh, and (17%) eighth.

Findings from the program pre-post assessment for the Summer, Fall, and Spring sessions indicated that 74% of students scored higher on the post-assessment. 74% of students scored higher on the post-assessment. 74% of students say they have better understanding of what scientists do; 68% believe they can become engineers, which is a 10% increase pre-post; and 71% of students would recommend the program to a friend. Student math attitudes also increased significantly by 6% pre- to post-test.

- The NC Science Olympiad and the Science House will host for the **2020 Science Olympiad National Tournament**.

- During the past year, The Science House completed our ninth year of offering **Modeling Institutes** for secondary science teachers and are currently in our tenth year of service (all funded by the MSP funds). During this decade, we have trained 608 teachers in an intensive professional development program that offers 120 credit hours each year focused on science content and transformative pedagogy in Biology, Chemistry, Physics, and Physical Science. During 2017-18 we served 68 teachers representing 27 public school districts, 4 private schools, and 2 charter schools. In the summer of 2018, we will train our 11th cohort of teachers with 96 more teachers scheduled to participate, which will bring the total number of teachers trained over the past eleven years to 704. This summer's experience will be different than past years, as it will be a summer only workshop and not include follow up sessions during the academic year. This change is necessitated by the conclusion of MSP funds. Research findings for this fiscal year found that:
 - Participants in all three content areas (Biology, Chemistry, Physics) demonstrated statistically-significantly gains in their knowledge of the targeted science content.
 - Participating teachers are more comfortable with their understanding of the instructional strategies promoted by the Modeling project on four composite indicators: perceived preparation to support development of science process skills, perceived preparation to plan effective lessons aligned with Modeling approach, perceived preparation to use a variety of standards-based instructional strategies, and confidence regarding aspects of investigative science instruction.
 - Participating teachers began the project reporting using a mix of "traditional" and "standards-based" instructional strategies in their science teaching, with some variety of assessment strategies and little use of technology. With the exception of technology use, their reported use in these areas showed significant shifts after Modeling professional development and support.
 - Results of pre/post student testing show significant growth in student understanding of the targeted concepts. Two thirds of students in targeted courses demonstrated significant pre/post gains on project-administered assessments.

- The Science House's program for high school students with disabilities, **Catalyst**, was selected as a Lemelson-MIT InvenTeams, a national competition among budding high school inventors. With the guidance of NC State faculty and students, 12 members of the Catalyst program developed a cost-effective pressure mat that screens for lameness in dairy cattle, inspired in part by visits to the Cherry Research Farm in Goldsboro and the NC State College of Veterinary Medicine. They were selected as **one of the top 15 teams in the country** — and the first that's exclusively made up of students with disabilities. In the summer of 2017 they won the Innovation prize at MIT and in June of 2018 they will visit the US Patent Office in Washington, DC after being invited by a patent officer who saw their invention.
- Hosted first workshop on physics for High School Girls called **LEAP (Launch Your Excellent Adventure with Physics)** with Karen Daniels where girls interacted with graduate students, researchers, and faculty from the Physics Department and learned about capturing subatomic particles, solar spectra, astrophysics in the computer, atomic force microscopy of DNA, programming arduinos, organic electronics, microfluidics, and more! We will do a second workshop on July 13, 2018 in Riddick Hall.
- Hosted second annual math conference for girls called **GAMMA (Girls in Applied Math, Modeling, Analysis)** on Saturday, April 8, 2018 with Lorena Bociu from the Department of Mathematics.
- Served as Principal Investigator and Co-Principal Investigator for 2 NSF projects: STEM Career Clubs (DRL-1433747) and Students Discover (DRL-1433747), accordingly.
- Formed a partnership with NCABR to make Citizen Science a major theme of its **Bridging the Gap Conference** in October of 2017. 100 teachers (Citizen Science Scholars) attended the conference and we are gearing up to do this again in October of 2018.
- Partnered with Southeast Raleigh High School to do a **Photonics Materials for the Future Day** for 36 students with Stefan Franzen. The goal of this day was to show high school students what cutting edge research is like in the area of photonics and materials science. This included making fluorescent molecules, plasmonic surfaces and photonic crystals among other applications. The day was a six-hour interactive event including tours and demonstrations by graduate students as a significant part of the day. There was also be brief presentations by faculty to show a cross section of the kind of cutting edge research that is currently being conducted at NC State.

The Science House was very active in advancing STEM literacy through a diverse array of K-12 outreach programs for students and teachers. Our programs engaged with local schools, educators, after-school programs, students, and families to enhance student

understanding and appreciation of science, technology, engineering and mathematics, as well as making STEM education accessible to underperforming, underrepresented, underserved, and disabled groups. Please see the attached **Activity Report** for more information on our activities.