

NC STATE UNIVERSITY

The Science House



Annual Report

July 1, 2019 – June 30, 2020

The Science House is vital in NC State's strategic 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 historically underserved and underrepresented undergraduate students.

The Science House served over 4,000 teachers and administrators and over 150,000 students through its many teacher and student programs. The Science House staff had over 2,200 contact hours with administrators, teachers, and students throughout North Carolina during the 2019-2020 school year. Because of COVID-19, many of our Spring and Summer 2020 programs were canceled limiting our reach and impact for the year.

Highlights from this year for The Science House include:

- The Science House responded to the lack of virtual K-12 STEM educational resources for K-12 students, parents, and teachers during the COVID-19 pandemic and developed a weekly virtual learning program called **The Science House Express**. This program provides timely STEM education resources, at home experiments, and interviews with scientists, researchers, and STEM professionals. The program covers a wide variety of STEM subjects providing quality education content for K-12 students. The program highlights prominent NC State University scientists, professors, and projects every week. The program has resulted in collaboration within NC State University on key projects including Citizen Science. The Science House Express has provided a variety of resource materials that have been archived for future use on [The Science House website](#). Since launching The Science House Express, The Science House has had 41,000 Social Media Impressions, a 20% average increase of followers across TSH social media channels, and over 1,000 views on YouTube. Some recent quotes include, "This is Awesome!" from Stephanie Lauren on Facebook and "Well done continue to inspire us and our emerging leaders" from Tseega Medhin on YouTube.
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- This year, **North Carolina Science Olympiad (NCSO)** became the largest Science Olympiad program in the nation. While the overall National Science Olympiad numbers have seen a 3% drop, NCSO saw 6% growth in middle school and an 11% increase in teams at the high school level.
 - **The North Carolina Science Olympiad (NCSO)** and NC State University signed a letter of agreement to work towards transitioning the 501(c)3 to become a program of NC State, the College of Sciences, and The Science House by July 1, 2020. Both NCSO and NC State are taking the necessary steps to move forward with this transition.
 - The **North Carolina Science Olympiad (NCSO)** continues to increase elementary school tournaments and advance its **Rural Participation Project**. The Rural Participation Project
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provides funds for rural tournaments, training for coaches, funds to cover registration fees and travel for teams in remote areas. NCSO increased the number of rural and economically distressed teachers and students participating in the Science Olympiad. Approximately 58% of teams and 71% of coaches receiving scholarships were located in Tier 1 (economically distressed) counties. In addition, 98% of teams and 100% of coaches who received scholarships were located in rural counties. The project has not only broken down barriers enabling traditionally underserved students to receive STEM education, but inspired them to pursue a future in STEM.

- In conjunction with NC State, the American Society for Civil Engineers and Lenovo, the **North Carolina Science Olympiad (NCSO)** developed a plan and content to try for a **Guinness Book of World Records in Most Simultaneous Virtual Reality Experiences** ever during the 2020 National Tournament Opening Ceremony. The North Carolina Science Olympiad **secured its largest in-kind gift ever (worth \$980,000) from Lenovo** in the form of over **2,000 virtual reality headsets**. This was the largest gift Lenovo ever gave to an educational entity. Unfortunately, due to COVID19, the 2020 National Science Olympiad Tournament was canceled and NCSO is now working to identify and train a key person in each NC county on how to use the Mirage Solo Virtual Reality Headsets. 20 headsets will be donated to each county for use with students and the public in virtual field trips.



- The right question, a curious mind, an idea explored, a new approach. All of these pursuits spark innovation. The **Wonder Challenge** campaign set out to do just that. From June 2019 - April 2020, the social media project featured monthly STEM challenges with a variety of North Carolina partners leading up to the **Science Olympiad National Tournament** at North Carolina State University, planned for May 2020. The goal of the campaign was to showcase how accessible STEM can be to participants from North Carolina and around the country. Partners included: NC State University, NC Science Festival, Morehead Planetarium and Science Center, Cisco, Burroughs Wellcome Fund, NC SMT Center, Queen Anne's Revenge Conservation Lab, Joint School of Nanoscience and Nanoengineering, American Society for Civil Engineers, Lenovo, Cree | Wolfspeed, Great Smoky Mountain National Park, BASF, and SAS. The Wonder Challenge amassed over 472,000 social media impressions. The Wonder Challenge, in large part, helped the NCSO achieve amazing social media growth including a 95% increase in Instagram followers, a 46% increase in Twitter followers, a 15% increase in Facebook followers, and a 19% increase in YouTube subscribers.



- The **NW Satellite Office** of The Science House partnered with **STEM West** to help develop our future workforce by creating the **Filling the Gap Train-the-Trainer Program**. This program not only informs teachers and students of local STEM careers, it uses Project Based Learning (PBL) so that students apply STEM content knowledge to help businesses solve problems. During the 2019-2020 academic year, 3 cohorts of teachers and administrators in Catawba, Burke, McDowell, Caldwell, and Alexander counties participated in the program. Overall, 41 middle and high school teachers and 12 administrators were trained in PBL unit development and were partnered with 21 STEM businesses in the region. Units were implemented during the school year that impacted about 3,442 students. This year's business partners were: Bemis, Vulcan (Lenoir and Morganton) Leviton, ABB, Setzer Machine, Schneider Mills, Exela Pharma, Craft Master, Blue Ridge Energy, Geiger International, Sparta Craft, Columbia Forest Products, Valdese Wastewater Treatment plant, Pepsi, Prysmian, ZF Chassis, Hickory Water Treatment plant, Turbocoating/Lincotek, Sarstedt, and Hickory Crawdads. Overall, we have partnered with 46+ local STEM businesses and 82+ teachers have implemented PBL units engaging 4,642+ students in real-world problems/issues.



- The **NW Satellite Office** partnered with Newton-Conover City Schools, Lenoir Rhyne University, Catawba Valley Community College, and local STEM businesses and received a grant to fund a 3-year after-school program for middle school students focused on creating **Makerspace Challenges related to local STEM businesses**. Last year units aligned with 6th grade curricula and were developed with Graystone Eye, Pepsi, McCreary Modern, and Hickory Museum of Art. This year, we focused on 7th grade science and math content with the Hickory Crawdads, Corning, Duke Energy and the Newton Fire Dept.
- The **NW Satellite Office** partnered with **Mt. Airy City Schools** to help improve their science curriculum in grades K-12. Due to increased teacher turnover rates and many new teachers, test scores have dropped recently. Two technology and inquiry professional development sessions were held for all science teachers in grades 3-12 and another was held on STEM and K-5 literature for primary and elementary school teachers in grades K-5. Several days of observation, coaching, feedback reports, and meetings followed. A total of 36 K-12 science teachers and 11 administrators participated potentially impacting 2,867 students. Additionally, 9 teachers checked out equipment for use with 762 students. Fifth grade science scores increased 11% from the previous year and 8th grade science scores increased 13% from the previous year.
- The **Rural Equipment and Technology Loan Program** was operated in both of The Science House Satellite Offices. The **Mountain Satellite Office** provided outreach and STEM equipment to all 18 school systems (100%) in its service area. This equated to direct service to over 4,300 students and 120 teachers/administrators during the 2019-20 school year. Approximately 8,000 students were scheduled to use the equipment, but closure of schools due to weather and COVID-19 impacted the number we were allowed to serve. The **NW Satellite Office** provided outreach and equipment to the following counties: Alexander, Burke, Caldwell, Catawba (including Hickory Public Schools and Newton-Conover City Schools), Cleveland, Iredell-Statesville, Mt. Airy City Schools, Guilford, McDowell, Union, Wilkes, Cabarrus and some private and charter schools. This equated to direct service to over 9,000 students and over 400 teachers/administrators during the 2019-20 school year.
- The **Mountain Satellite Office** provided professional development services for 1555 teachers/administrators during the 2019-20 school year. This reached over 65,280 students! Over 98% of teachers attending workshops 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. These teachers either attended open registration workshops or workshops contracted by the host organization. 100% of all school systems contracting with MSO for Sustained STEM Support have *repeated* their request for service, demonstrating that progress garnered through the initiatives was deemed worthwhile by the systems and worth continued investment.
- The Science House started a new targeted program this year called **The Redefining Innovative Schools through Sustained STEM Experiences (RISE) Project**. This project provides customized cultural transformation, NOT a cookie cutter strategy for participating schools. The RISE Project allows schools to refine, implement, sustain, and scale powerful teaching and learning strategies adapted to its needs and assets with:



- Targeted Professional Development;
- Coaching and Sustained Support to Transform School Culture; and
- Team Building Custom Action Plan

During the inaugural year of this project, 4 schools signed on to be part of this innovative program to help their schools transform to better meet the needs of every student. Because of COVID-19, the project is in a holding pattern, but we are continuing to work with these first 4 schools and recruiting new schools for the 2020-21 academic year. Here are a couple of quotes from Principals participating in the project:



“Bowman Middle School is simply grateful for the RISE program! This program has pulled our staff together and increased cooperation across all grade levels and content areas. Not only has the morale of the faculty improved, but we have grown as professionals and we have increased the level of individual ownership in the systemic culture of our school.”

-- Paula Holder, Principal

“I have really appreciated the support of the RISE staff during our school's time of transition. The professional learning has been timely and relevant as we begin [Glenwood Elementary School's] journey to becoming a STEAM² Magnet School. RISE staff conducted site visits, coaching sessions, staff development and shared other opportunities throughout the state to grow our understanding of PBL and STEM.”

-- Channing Bennett, Principal

- **Kyran Anderson and Imhotep Academies** provided 140 hours of innovative STEM programming to 223 elementary and middle school students in North Carolina. 50% of the participants were Female. Ethnicity for the program included the following percentages: 73.5% Black or African American, 2.2% Hispanic/Latino; .4% American Indian/Alaska Native, 7.2% Asian, 0% Native Hawaiian/Other Pacific Islander, 6.7% White, 10% Multiracial. The school settings included: 64.1% Public, 18.8% Charter, 4.9% Homeschool, 9% Private and 3.1%. In 2019-20, students discovered the wonder of robotics, The Internet of Things (IOT), engineering, computer science, gaming, the science of addiction, UN sustainability goals, and climate change in their everyday life. These disciplines predominantly have a low representation of African American, Latinx, and female students. Program exposure included participation in laboratory exercises, STEM challenges, tours, field trips, and oral presentations that developed students' awareness and knowledge of what scientists and engineers might do in their job. Parents were introduced to STEM content, careers, and cutting-edge research through program meetings. Teachers, undergraduate and graduate students grow as professionals implementing innovative content to diverse participants.



- The Science House hosted a **Modeling Instruction Summer Institute in Physics (Mechanics)** in July of 2019. The course was 60 hours in length. The dual goals of this workshop were to increase teacher content knowledge in Physics while providing instruction and knowledge in how to teach the content using a Modeling pedagogical approach. Content knowledge was measured using a validated instrument, the Force Concept Inventory. Teachers were pre-tested and post-tested. **Post-test results revealed an average 12% increase in content knowledge.** Teachers were asked to rate the workshop on a scale of 1 to 10 with 10 being the best. **The average rating**

was a very high 9.72. On a scale of 1 to 5 from not effective (1) to highly effective (5) workshop leaders were evaluated to be highly effective in communicating concepts (4.9), actively engaging participants (4.9), consolidating learning (5.0), and providing opportunities for teachers to apply what they learned in context (4.9).

- The Science House's award-winning program for high school students with disabilities, **Catalyst**, served 24 more students this year. The participants included 5 graduating seniors and 100% (i.e., 5 of 5 youths) were accepted to a postsecondary institution. Specifically, students were granted admission to NC State University, UNC-Chapel Hill, Appalachian State University, and Wake Technical Community College. Catalyst won two awards from The National Energy Education Development (NEED) Project - "North Carolina Special Project of the Year" and "National Special Project Rookie of the Year." The students will receive \$1,000 to attend the 40th Annual NEED Youth Energy Conference and Awards gathering in Washington, DC. Responses on the NC State University Maximizing the Impact of STEM Outreach (MISO) Student Attitudes Toward STEM (S-STEM) Survey for Middle and High School



Students revealed that 96% of participants plan to have a STEM career as an adult and felt that Catalyst helped prepare them to enter such a career. **Catalyst also received funding from the NC Department of Health and Human Services in the amount of \$85,800 for the 2020-2021 school year with the opportunity to renew funding in subsequent years.** Catalyst also placed 9 students in internships the following locations: Micro World and

Prairie Ridge at the NC Museum of Natural Science, NCDENR - the Air Quality Division, Industrial Engineering at NCSU, the NCSU Physics Department, NCSU Aerospace and Mechanical Engineering, the ASSIST Center and Walnut Creek Wetlands.

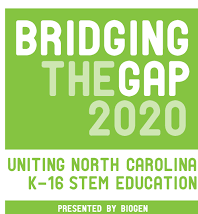


- The Science House finished its work on the final year of its **NSF Project: Students Discover (NSF Award #: 1319293, 2013-2020)**. The Science House has been indelibly changed by its work on the Students Discover Project. Prior to becoming involved in this project, The Science House conducted primarily inquiry-based, hands-on STEM programs and competitions for students and teachers; however, very few of the STEM programs engaged students and teachers in *real, relevant* science. The Students Discover project, along with the rise of connectedness and low-cost sensor technologies, transformed The Science House's student program and professional development portfolio to connect K-12 students and teachers to scientists and researchers and to provide them opportunities to contribute to science. The Science House is helping students and teachers engage in meaningful science research that addresses real world issues that sometimes leads to scientific advancement. By supporting students and teachers in direct participation in citizen science, The Science House is making science more accessible and empowering students and teachers to identify as active agents of scientific discovery. Moreover, The Science House's Rural Equipment Loan Program has changed to include the tools and technologies needed for rural schools and schools without access to necessary technologies to borrow them to participate in Citizen Science projects that require them. For example, schools can check out data collection tools such as Vernier LabQuests and probes, iPads, water quality monitoring tools, Sky Quality monitors, and many

other kits and supplies to support them in implementing Citizen Science projects in classrooms. The Science House will continue its partnerships with **Rob Dunn's Public Science Lab**, **SciStarter**, and the **Leadership in Public Science Cluster at NC State** among others to offer expanded Citizen Science opportunities for students and teachers for the foreseeable future. In fact, **The Science House** just launched a **Virtual Citizen Science Challenge** to K-12 students across the nation.

- The Science House hosted the third annual workshop on physics for High School Girls called **LEAP (Launch Your Excellent Adventure with Physics)** with Karen Daniels. **48 girls** interacted with graduate students, researchers, and faculty from the Physics Department and learned about optics, atmospheric hadron collider, supernova mysteries, arduinos, cutting cellular skeletons with lasers, colliders and colors, mini-ligo, and seeing their own DNA!

- The Science House continued the third year of a partnership with the North Carolina Association for Biomedical Research (NCABR) to make Citizen Science a major theme of **Bridging the Gap Conference** in October of 2019. Bridging the Gap is a statewide conference that unites K-12 education, higher education, industry, government and other STEM groups to work toward the common goal of strengthening K-16 STEM education in North Carolina. The Science House sponsored **85 teachers (Science House Scholars)** to attend the conference and they were required to attend specially designated concurrent sessions about citizen science during the two-day conference. Session titles included: Never Home Alone: Studying the Life in Schools and



Homes, The Teacher Collaborative Experiments, Using Citizen Science Genomics/Genetics Data in the Classroom, Scistarter as a Gateway for Bringing Citizen Science into the Classroom, Integrating Climate Change Science into the Classroom, and Sourdough for Science. Many NC State faculty and graduate students participated in these presentations including Rob Dunn, Erin McKenney, Danielle Lawson, Deja Perkins, Caren Cooper, Carlos Goller, and Meredith Spence Beaulieu.

- The Science House (TSH) and the Center for Inquiry Based Learning (CIBL) partnered to create the **STEM Family Challenge (STEM^{FC}) Program** to provide schools, after school programs, and other youth serving organizations the opportunity to build and enhance relationships with family members and to engage and inspire young people to explore STEM in a fun way. This program is a 100-minute program that combines science learning and family bonding with family and community participation. **STEM^{FC}** provides hands-on and competitive activities that demonstrate a variety of scientific principles and make STEM (science, technology, engineering and mathematics) learning fun, accessible, and more appealing to today's students. The **STEM^{FC}** program is designed for parents and caregivers to self-guide their students through each activity, thereby supporting family-learning experiences that encourage children to continue pursuing STEM subjects through higher academic levels. The program was piloted at Dudley Shoals Middle School, Creedmoor Elementary School of the Arts, The Fletcher Academy, and during a Family Day for Cree/Wolfsped.



- The Science House collaborated with Dr. Eric C. Chi and Dr. Ana-Maria Staicu to develop the **Data Scientists Training (DST) Program**. This program is a year-long exploration for high

school students and educators designed specifically to introduce high school students to potential careers in data science that features:

- A summer bootcamp in core data science fundamentals from statistics and computer science,
- Supervised sessions over the academic year to work on team-based data analysis projects that participants code and develop,
- Explorations in how data science can help extract and apply relevant information to daily life,
- Opportunities for student participants to communicate results of their year-long data analyses findings,
- Site visit(s) to local data science companies, and
- Career discussions with real-life data scientists about their unique career pathways.



- **CRECER (Cultivating Research Experiences with Community-Engaged Roots)** is a unique program for Hispanic/Latinx students from Jordan-Matthews and Lee County High Schools in North Carolina. Funded by the Burroughs Wellcome Fund Student STEM Enrichment Program and developed through a partnership between NC State University Biological Sciences faculty (Dr. Claire Gordy and Dr. Melissa Ramirez), **The Science House**, Chatham and Lee County 4-H, and JMHS and LCHS teachers, CRECER had recruited its first cohort of young scientist-scholars to attend a Summer Research Experience in 2020; however, COVID-19 has delayed those plans until Summer 2021. Participants will spend a week at NCSU immersed in authentic research focused on using cutting-edge genomics technologies to understand the microbial communities present in the soil of agricultural sites in their communities. Participants will also be mentored by Latinx college students, discuss their science in both English and Spanish, and receive training in the "soft skills" needed for successful college applications. Over the academic year, the participants will use the skills and techniques they learned during the Summer Research Experience to design and test their own hypotheses -- How do the microbes present in their soil samples affect plant growth? How do the microbial communities change over time? Through participation in CRECER 4-H clubs at their schools, these scientist-scholars will explore additional topics related to microbiology, genetics, and agriculture and gain opportunities for community outreach and leadership.
- The Science House's FIRST Robotics Tech Challenge team, the **TUNDRABOTS**, had an amazing campaign during the 2019-2020 tournament season finishing in the Final Alliance of the North Carolina State Championships!
- The Science House secured **\$208,521** in funding during the 2019-2020 fiscal year to provide: 1) **Coaching and Consulting services**; 2) **Student Programs**; and 3) **Teacher Professional Development Workshops**. The Science House **lost \$217,411 in revenue due to COVID-19**. The Science House and the NC Science Olympiad also received **over \$700,000** in grants and donations during the 2019-2020 fiscal year (not counting the VR headset donation).