

Annual Report

July 1, 2023 – June 30, 2024

The Science House (TSH), the K-12 Outreach Unit for NC State’s College of Sciences, had an incredible year providing STEM outreach programs to students and teachers throughout North Carolina. TSH programs impacted 156,069 students and 4,608 teachers. The Rural Equipment Loan program supplied resources, labs, kits, and technologies to perform hands-on STEM investigations to 236 teachers serving 16,975 students. TSH’s student and teacher programs occurred in 78 out of the 100 North Carolina counties during the 2023 - 2024 fiscal year. Below are programmatic highlights for TSH programs in the past year.

North Carolina Science Olympiad

In 2019, prior to the pandemic, the North Carolina Science Olympiad (NCSO) was thriving, with over 900 teams participating in our competitions. However, the unexpected circumstances of 2020 brought a significant drop in participation as schools and students faced unprecedented challenges. Since then, we have been steadily rebuilding and are encouraged by our progress. In 2022, we returned to in-person competitions, and our team registrations totaled 548 teams. In the past two years, we’ve seen a 38% increase to 755 teams participating. While we are not yet fully restored to our pre-pandemic levels, we are confident that we are on the right track.



NCSO launched two new elementary tournaments this year as part of our ongoing commitment to expand access to NCSO to rural and underserved areas. The Sandhills Tournament was held at Alpha Academy in Fayetteville, led by Chonita Jones. The Elizabeth City Division A Regional Tournament took place at the College of the Albemarle - Elizabeth City, under the leadership of Lisa Meads.

Thanks to the Backyard Foundation's generous support, NCSO provided scholarships that covered the costs of the Coaches Conference and regional tournament registration for five deserving rural teams. In addition, ten rural teams received custom kits filled with essential Science Olympiad event supplies. These kits ensure that all students, regardless of their school's resources, have access to the materials needed to excel in their chosen events.



NCSO teamed up with longtime sponsor Wolfsped and the Daniels Center in Raleigh to host a fun-filled day of STEM learning for the local community. Attendees had the opportunity to explore interactive events, participate in engaging builds, and discover the wonders of science. Building on that momentum, we joined forces with the renowned Marbles Kids Museum in September to kick off our elementary tournament season. This collaboration allowed participants to practice and showcase their NCSO skills before competing. It was a fantastic opportunity for our young STEM enthusiasts to hone their abilities, learn with peers, and gain valuable experience in a supportive and enriching environment.



NCSO joined forces with the NASCAR Hall of Fame in Charlotte, NC to bring STEM education to the local community. Through interactive demonstrations and hands-on activities, we engaged attendees in STEM activities that drive the world of motorsports. It was an exciting and engaging way to inspire the next generation of STEM innovators and problem-solvers.

IMHOTEP and Kyran Anderson Academies

Imhotep and Kyran Anderson Academies (IKAA) expanded their engagement efforts across North Carolina and beyond during 2023-24. Continuing their mission to reach underserved students, 87% of program participants were African-American, Latino, or Native American students; 55% identified as girls or non-binary; and more than 80% received need-based financial support to participate in the program.



IKAA focused on deepening partnerships internally and externally this year. The Wilson College of Textiles supported IKAA students in learning about innovative STEM-related careers in textile engineering and provided a full week of funded STEM programming (equalling more than \$12,500 in funding) for 32 students. Hitachi Energy fully funded a programming session themed on energy and sustainability (\$2,000). Both of these programs promoted STEM entrepreneurship in their respective areas. IKAA also partnered with and received additional financial support from Digikey, Red Hat, the National Girls Collaborative Project, and Burroughs Wellcome Fund for middle-grades programming

in northeastern NC. A new partnership with GlaxoSmithKline will provide scholarships for more than 1,200 students to receive IKAA programming across North Carolina during the next three summers. This partnership will expose students to new careers in STEM and connect this career exploration to hands-on science investigations.

Imhotep Academy held five sessions this year, including four in-person offerings and one virtual session. 206 students from 10 counties in NC participated. Session offerings during the year included a session focused on textiles, making, and 3D printing; a forensic science session; a series of sessions partnering with the Data Science Academy to promote data science in STEM; and a robotics session supporting North Carolina's SparkNC STEM initiative.



Kyran Anderson Academy collaborated with NC State's Food Sciences programs in CALS and focused on food safety, bioengineered food, and nutrition. The program served 60 students, primarily from NC, with several from Georgia, Virginia, Florida, and Maryland. Through a survey, parents believed that after participating, their students were more knowledgeable about STEM concepts (96%) and were more excited about STEM (100%). 98% of participating students would recommend the program to their peers.

Imhotep and Kyran students also participated in a University event to promote STEM engagement, where they had the opportunity to talk with astronaut and NC State alum Christina Koch (pictured below) about her STEM journey. More than 100 current and former program participants attended.



Data Explorers

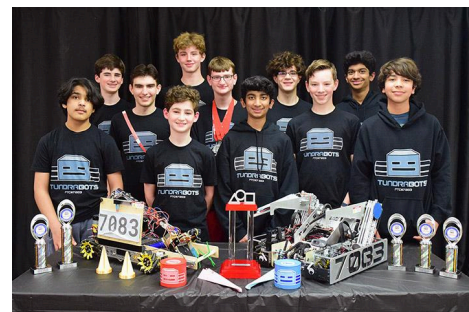
The Data Explorers program, with generous support from the Goodnight Educational Foundation, has grown from a professional development cohort to a comprehensive initiative focused on advancing data science education in North Carolina. In September 2023, we hosted the NC Data Science Education Summit (pictured below), where teachers, researchers, industry partners, and consultants from the NC Department of Public Instruction (NCDPI) convened to discuss the future of Data-Enabled Teaching and Learning in North Carolina. This event fostered a partnership with NCDPI and launched initiatives, including updating the Intro to Data Science curriculum and exploring the development of a data science infrastructure for all NC schools.



Additionally, Data Explorers partnered with the Center for Human Health and the Environment (CHHE). They led a successful Real Teaching with Real Data Workshop, where educators from seven NC school districts learned to incorporate NC State research data into their classroom instruction and provide their students with authentic data experiences. Due to its success, our collaboration with CHHE has expanded into a yearlong cohort program. We've also partnered with campus entities like the Imhotep Academy, the Genetics and Genomics Academy's Kenan Fellows, and the Friday Institute's Fostering Learning, Identity, and Participation within Science, Technology, Engineering, and Mathematics (FLIP-STEM) Hub to integrate data science into student programming.

Robotics

The FIRST Tech Challenge Robotics Program, Biome Robotics, competed in 2023-24 as a single team #7083 TundraBots. The team had four returning veteran students and added seven new rookie students ranging from 7th through 12th grades. In addition, the team had a total of five registered adult coaches/mentors. The team ended up building two competitive robots, competing successfully with the first one at the beginning of the season, where they won several awards and qualified for the FTC NC State Championship Tournament, and later in the season with a second robot with which they continued to garner success and eventually win the North Carolina State Championship. One 12th-grade student



graduated and will be pursuing engineering at Marshall University. The rest of the team continues to meet in the off-season, adding one new student, attempting to recruit new coaches/mentors, developing software and programming skills, improving the robots, and practicing for scrimmage competitions. These students and adults spent over 2000 hours working on and competing with their robots.

Modeling Instruction

The Science House began the third project year of the four-year \$2,596,576 National Science Foundation (NSF) Discovery Research PreK-12 (DRK-12) project, ***Supporting the Implementation of Modeling Instruction in Rural Schools (SIMIRS)***. During 2023-24, the project provided three summer weeks (90 hours) of Modeling Instruction professional development to Cohort 2 high school Biology and Chemistry teachers and four additional follow-up days (24 hours) during the academic year. These workshops served 29 teachers from 19 school districts across North Carolina. One Biology teacher said the following about the summer experience:



“The workshop’s hands-on approach to learning modeling techniques was particularly effective for me, as it allowed me to actively engage with the material and develop a deeper understanding of its application in biology teaching.”

Over the past academic year, the project provided in-classroom support to teachers from Cohort 1 (trained in 2022) and Cohort 2. The teachers continue implementing what they learned in the workshops while project mentors support them. The Science House partners with NC State’s College of Education in research activities examining teacher Pedagogical Content Knowledge (PCK) and virtual mentoring.

Synthetic Biology Teacher Workshop



For the second consecutive year, TSH partnered with Dr. Anna Stepanova in the Department of Plant and Microbial Biology to offer a professional development opportunity for high school science teachers called the **Synthetic Biology Teacher Workshop**. This work was funded by Dr. Stepanova’s NSF CAREER Award, *Tailoring hormone responses in plants via synthetic signal integration devices*. The 2023 workshop provided 30 hours of professional development on basic recombinant DNA technology and synthetic biology and served 17 teachers from 11 different North Carolina counties and two other states. These teachers also had access to an equipment lending library over the past academic year. In a post-workshop assessment, all the teachers said they would recommend this workshop to their peers. One teacher said the following about the experience:

“This workshop was a fantastic professional development experience. I gained a much broader and deeper understanding of the field of synthetic biology and how local researchers are applying related concepts and technologies, as well as ways to incorporate these concepts into my curriculum. I also learned so much about what NC State offers and how my students might benefit (facility tours,

connections with researchers, equipment loaning, sample preparation, etc.). I am so excited to bring what I have learned back to my classroom to help my students connect the topics in our curriculum to their lives and communities and hopefully encourage many of them to enter the STEM pipeline!"

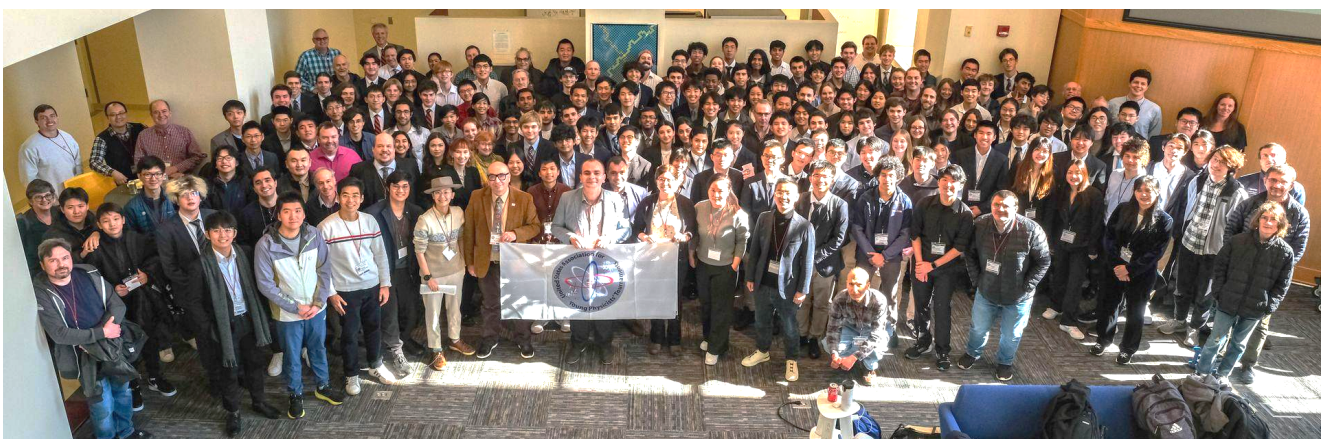
AgDiscovery

The Science House hosted the **2024 AgDiscovery Summer Youth Program** this year at NC State during the final two weeks of June. TSH and the US Department of Agriculture (USDA) welcomed 16 high school students from CA, PA, MD, VA, LA, NC, and FL. This two-week residential camp was packed with various activities, including Pest Detection and Identification, tours of the Vet School, Dairy Farm, and the Plant Sciences Building, and trips to Seymour Johnson Air Force Base, the Conservator's Center, and the NCSU Compost facility. The students also worked in teams to design an irrigation system in a desertification environment. Last year's group made the cover of this year's USDA program (pictured to the right)!



United States Invitational Young Physicists Tournament (USIYPT)

The Science House and NC State's Department of Physics partnered with the US Association of Young Physicists to host the **United States Invitational Young Physicists Tournament (USIYPT)** on campus the weekend of February 2-4, 2024 (see picture below). This tournament brought some of the best and brightest high school physics students to NC State University, where they competed in a conversational debate competition focused on challenging physics problems. The competition included 16 high school teams comprised of 124 students and 28 coaches. The competing schools were from the United States, and international teams were from China and Georgia. Faculty, staff, and students from NC State University volunteered to make this event a success, including a keynote address from Assistant Professor Rongmon Bordoloi on Galaxy Evolution and the James Webb Space Telescope.



Catalyst

The Science House's year-long program for high school students with disabilities, **Catalyst**, in partnership with the NC Department of Health and Human Services and Pre-Employment Transition Services, served 40 students in its 8th year of operation. The Catalyst program provides participants with job exploration counseling, workforce readiness training, work-based learning experiences, counseling on post-secondary training options, and instruction in self-advocacy. Students attend a STEM summer camp, Fall and Spring

STEM Academies, and STEM internships totaling over 100 hours of instruction, exploration, and training. NCDHHS provided \$407,880 to support this program this past fiscal year.



Catalyst students visited the International Institute of Tropical Forestry in Puerto Rico for a Field Studies Trip in Tropical Ecosystems. They visited research labs, hiked in Luquillo Tropical Rain Forest with US Forestry Service Staff, visited the Manatee Rehabilitation Center, kayaked to see bioluminescent phytoplankton and learn about marine ecology, and toured Old San Juan to view STEM through historical and cultural sites. This trip was funded by Dominion Energy, ABB, Burroughs Wellcome Foundation, Rossi Fund, Red Hat, and N.C. Vocational Rehabilitation.

On April 4, 2024, Catalyst hosted Reach for the Stars! Be a Star! STEM and Resource Fair for K-12 students with disabilities, families, and friends. 71 tables were staffed with professors, grad students, and STEM professionals with engaging hands-on activities and resources for STEM careers and educational pathways. Fair speakers talked about workforce development supports and several STEM career pathways. Congresswoman Ross and NC Representative Frank Sossoman also attended to show their support for building a diverse, inclusive, and innovative STEM workforce! This fantastic event was funded by the generous support of ABB, NC Space Grant, the Burroughs Wellcome Fund, Lenovo, the NC Science Festival, and Collins/Raytheon. Over 600 students attend.



This year, 18 seniors graduated from the Catalyst program. All are planning to have a STEM major in college. Graduates are planning on attending North Carolina State University, UNC-Chapel Hill, UNC-Charlotte, UNC-Greensboro, Appalachian State University, University of South Carolina, Peace University, Campbell University, Sandhills Community College and Central Carolina Community Collège, and the US Navy Nuclear Engineering Program. Catalyst participants received many awards and achievements this year, including high GPAs, STEM internships, completing AP classes, scholarships, and a National Merit Finalist. The Science House completed its third year of a three-year \$1,345,466 NSF ITEST Catalyst project entitled Connecting Students with Autism to Geographic Information Science & Technology (CSA-GIST) Careers. Thirty-three students in two cohorts have participated in the CSA-GIST programming since it began in Fall 2021. The program consists of (1) 30 weeks of Online Drone Classes that are self-paced experiences and require 1 hour of learner engagement per week (30 total hours), (2) 16 monthly in-person Saturday GIST Academy sessions (three hours each, 48 total hours), and (3) 2 face-to-face week-long summer Institutes (80 total hours). 16 Cohort 1 participants graduated (see picture below) in Fall 2023, and 17 Cohort 2

participants will graduate in July 2024. CSA-GIST also has an extensive research component led by Jamie Pearson focused on generating knowledge about how the design elements of the workforce development model intersect with self-regulation constructs for high school students with ASD in face-to-face, online, and hybrid learning contexts. Cohort 1 students were given the option to take the FAA 107 Remote Pilot Certification Exam. 12/16 students volunteered to take the test, and 11/12 that took the test passed!



Homework Haven

Homework Haven has consistently working with six students this academic year. During the 2023-2024 school year Homework Haven provided approximately 384 hours of tutoring in 49 days of school instruction. We currently have one Pre-K student, one first-grade student, one third-grade student, two fourth-grade students, and one fifth-grade student enrolled in the program. This school academic year we benefited from 372 volunteer tutor work hours.

Satellite Offices and the Rural Equipment Loan Program

We are excited to announce the re-opening of the **Coastal Satellite Office** at the Center for Marine Sciences and Technology (CMAST) in Morehead City. Marsha Sirkin (pictured to the right) was hired to lead the Coastal Office on March 25, 2024. Marsha has twenty-one years of experience as an outstanding STEM educator and Digital Learning Coach. She also served as an NCBOLD Ambassador through the North Carolina Department of Instruction to deliver exceptional teaching strategies for educators statewide. Her experience connecting educators with excellent instructional practices will be essential in igniting a love for STEM in the region and beyond with students and teachers. Marsha is working with Mountain Satellite Office Director Michelle Taylor and Mountain Satellite Office Assistant Director Jason Carter to learn from their highly successful model and is currently:



- Announcing opportunities for teachers to participate in the STEM to Your Doorstep Program,
- Connecting with schools and districts to seek opportunities to serve the area, and
- Promoting new professional development around Science and Engineering Practices with new state standards in mind.

The **Mountain Satellite Office** provided over 400 hours of professional development to more than 900 teachers, impacting over 60,000 students. The Mountain Satellite Office staff designed innovative curricula

and led professional development for K-12 teachers, focusing on supporting teachers in shifting to more student-centered instruction using science and engineering practices. Below are some of the professional development offerings from this past year.

- **STEM to Your Doorstep** provides training for K-12 teachers on technology, resources, and lab materials available for free through our Rural Equipment Loan Program through our Central, Mountain, and Coastal Offices. The training focuses on grade-level activities using MacBooks, LabQuests, and various probes to explore science and math concepts. After the training, teachers can participate in the equipment loan program, where TSH staff deliver classroom technology, equipment, STEM kits, and lab materials free of charge.
- **Introduction to Modeling and the Science and Engineering Practices (SEPs)** introduces teachers to the instructional methods of SEPs and Modeling. North Carolina's new science standards heavily emphasized Science and Engineering Practices (SEPs). Modeling Instruction makes SEPS a central practice in classroom instruction. This research-based, reform-oriented pedagogy helps correct the many weaknesses of the lecture-demonstration method of teaching found in many classrooms, including the fragmentation of knowledge, student passivity, and the persistence of naive beliefs about the physical world. Scientists learn by doing: they construct and deploy models of the real world and test their ability to predict new phenomena.
- **Get Out: Using Outside as a STEM Tool** takes the indoor classroom outside and brings STEM to life. Using various tools such as GooseChase, Geocaching, iNaturalist, and others, teachers learn to use the "outside" as their primary STEM tool. Teachers learn how to integrate STEM into social studies, ELA, and science curricula, help students acquire and synthesize knowledge through experiential learning, and design lessons using STEM tools and curricula that fit their grade level and content area.
- **Shifting from a Sage on the Stage to a Guide on the Side: Classroom Management Techniques for the Science and STEM Classroom** puts teachers in the learner role, and they experience a variety of collaborative, engaging, and minds-on strategies. They compare and contrast "old school" methods with more inquiry-based pedagogy and learn how to shift traditional good lessons to student-centered great lessons. Tony Wagner's seven essential survival skills are highlighted as participants explore PBL practices and implementation protocols to support class management.
- **Vaping: How Bad Is It Really?** The Mountain Office of The Science House tackled this question with an innovative curriculum we developed for middle and high using the latest research from UNC-Chapel Hill. Over 20 classes of students and over 120 teachers across the state learned more about the impact of vaping on our bodies this year! Those teachers can now use this lesson in their classes next year.



- **Mobile STEM Labs** provide rural and underserved students across NC opportunities to solve real-world STEM problems in their own classrooms (more than 600 students). At the same time, over 70 teachers received in-classroom STEM professional development with their students as the model group. The students (pictured to the right) are learning about micropipetting, PCR, gel electrophoresis, and genetics to determine which dog is the father of Molly's (the labradoodle) puppies. Genetics and Biotechnology are vital STEM fields in our growing NC economic climate.



- **Exploring Plant Genetics** provides teachers with visits and interactions with faculty and graduate students involved with research on different varieties of plants at the Mountain Horticultural Crops Research and Extension Center. The morning is spent with discussions, site visits, and activities exploring the research happening at the Center. The afternoon is spent in the classroom doing investigations related to the research and includes materials, supplies, and other resources for teachers to take with them so they can implement them in their classrooms.

Professional development (PD) done by the Mountain Satellite Office is always highly evaluated and praised. Below are some quotes demonstrating how teachers felt about the PD provided by the Mountain Satellite Office.

- *This has been one of the best PD's I have had the opportunity to attend. The presenters added joy to the sessions. They took time to know us as people and what role we have in our schools. They chose activities that put the "heavy lifting" on us and simulated what our classrooms should look like.*
- *My time here was very much worthwhile! I am leaving with a much better understanding of the new science standards and engaging ways to have students master the content while being engaged and participating in the SEPs.*
- *I have completely changed how I look at teaching as a result of this workshop. As an English teacher, I have struggled with bringing informational (historical and scientific) texts to life. I have a new outlook on how to make these texts tangible, relatable, and personal to all students. I can't wait to jump back into the classroom and expand the horizons of my students.*
- *Michelle and Jason are for sure the bomb dot com! Their energy is contagious, and I have loved every moment with them! Not only are they fantastic educational presenters who bring the curriculum to life, but they are also the most personable individuals. I have felt like these presenters treated me as not just a "student," but rather as a friend. This has been the best PD I have ever been to!*
- *I LOVED all of the energy from the instructors and how passionate they were when guiding us through labs and using the strategies. I can't wait to use some of the things that were modeled for us and see how well my students do by utilizing the strategies presented to us this week!*
- *Thank you for this awesome professional development! I truly believe every teacher would be refreshed if they applied, committed, and attended a Science House training! Thanks again for this amazing experience!*



ARIS ENDURING ACHIEVEMENT AWARD

The Science House was recognized with the Center for Advancing Research Impact in Society's (ARIS) 2024 Enduring Achievement Award. The ARIS awards recognize researchers and practitioners undertaking

exemplary work in research and higher education. The Enduring Achievement Award specifically recognizes organizations that demonstrate achievement in research engagement and societal impact.

Bulletin Board

The Science House Earns Enduring Achievement Award

NC State's STEM hub for K-12 students across the state was recognized for its societal impact and public engagement through science education.

February 28, 2024 | [Patrick Smith](#) | 3-min. read



Students gather around a tablet as part of an activity at The Science House's IMHOTEP Academy.