

**EXPERIENCE**  
**STEAM**  
IMPACT REPORT

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IMPACT REPORT

**View this report online by scanning this QR Code or visiting:**

[https://issuu.com/ncatech/docs/experience\\_steam\\_impact\\_report\\_-\\_draft\\_-\\_for\\_print](https://issuu.com/ncatech/docs/experience_steam_impact_report_-_draft_-_for_print)

# EVENT OVERVIEW

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The National Center for Autonomous Technologies (NCAT) and partners teamed up with Mall of America for their 30th Birthday Celebration to offer Experience STEAM on August 10-14, 2022. This event was created to spark excitement in STEAM (science, technology, engineering, arts, math) concepts, education, and careers. Activities included a STEAM Carnival, which consisted of tactile educational experiences, student competitions, and cost-free pre-registered student camps and educator workshops. Providing the STEAM experience was just the beginning, followed by a direct pathway to post-secondary education and a career in the STEAM field. The National Science Foundation (NSF), Minnesota State Colleges & Universities, and over 55 educational and corporate partners were there to guide the way.

— “ —————

**Experience STEAM is a revolutionary approach to educational outreach. NCAT believes experiential learning provided by two-year technician education is a driving force in advancing social and economic mobility.**

—Jonathan Beck  
NCAT Executive Director

————— ” —

The NCAT team focused on using this event to demonstrate accessible pathways and reducing barriers to entering the skilled technical workforce. Our dream is that Experience STEAM offered life changing opportunities to connect people to education using hands-on learning. With thoughtful collaboration, we can spark the imaginations of our nation's future skilled technical workforce.

**NCAT worked closely with Mall of America to create STEAM attractions at all of the major public spaces in the mall. These seven STEAM Carnival areas focused on diverse community representation, contributing to the welcoming and positive atmosphere.**

26 NSF ATE supported centers and projects had an opportunity to see the work of the community in action. The ATE Collaborative Exhibit hosted an informational booth and interacted with many educators across the state of Minnesota and the region. The participation of the Minnesota State Colleges and Universities System Office Leadership and partners, including six Minnesota State Centers of Excellence opened the doors to ideas and collaborations that will support the continued growth of ATE projects, especially for institutions and organizations new to ATE.





From left to right: Devinder Malholtra (MN State Chancellor), Roger Moe (Chair, MN Board of Trustees), Dean Phillips (U.S. Rep - MN 3rd Dist), Jill Renslow (MOA Sr Vice Pres), Tim Busse (Bloomington Mayor), Sandra Kiddoo (Northland President)





# THE WHY

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**The vision of Experience STEAM at Mall of America is to inspire social and economic mobility enabled by access to opportunities inspiring students to consider emerging technology and technician career fields.**

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**\*\*The U.S. Bureau of Labor Statistics projects more than 1,000,000 STEM jobs will have been added by 2030, representing nearly 11% growth compared to less than 8% for all other industries.**

# ATE OUTCOMES

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To advance the ATE program's mission of educating the skilled technical workforce, ATE Centers will:

- **Support** systemic reform, broad outreach, community-building, and leadership development among educational institutions, industry, professional and trade associations, educators, and incumbent technicians;
- **Establish** an effective dialogue and collaborations between existing and new ATE projects in the same or related technological fields across the nation;
- **Provide** models and leadership for collaborations in which two-year IHEs work with four-year IHEs, secondary schools, business, industry, economic development agencies, and government;
- **Mentor** prospective Principal Investigators to broaden the impact of ATE;
- **Promote** technician careers and visibility and the public image in the field(s) on which the Center is focused;
- **Address** technician knowledge, skills, and competencies needed for the evolving, converging, and emerging technical workplace;
- **Provide** faculty professional development opportunities within their area of expertise; and
- **Develop** a realistic plan for achieving sustainability and institutionalization of key center functions following the period of NSF funding.

# WHO & WHAT

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**57** FIFTY SEVEN

**ORGANIZATIONS PARTICIPATED IN THE STEAM CARNIVAL, WORKFORCE DEVELOPMENT WORKSHOPS, & STUDENT CAMPS**

All STEAM Carnival activities took place throughout the 5.6 million square foot Mall of America space, including the North Parking Lot, North Atrium, North Garden, Macy's Court, Southeast Court, Rotunda, West Market Square and more.

**26** TWENTY SIX

**NSF ATE CENTERS AND PROJECTS CONTRIBUTED TO THE EXPERIENCE, BRINGING TOGETHER THE ATE COMMUNITY**

Other contributors include Minnesota State, the Minnesota State Centers of Excellence, local high-tech corporations, and local educational organizations.

**18** EIGHT TEEN

**WORKFORCE DEVELOPMENT EDUCATOR WORKSHOPS OFFERED**

All workshops were offered cost-free to attendees, with an overall attendance of 130+ participants.

**14** FOUR TEEN

**STUDENT CAMPS OFFERED FOR GRADES 7-12 & POST-SECONDARY**

All camps were offered cost-free to attendees, with an overall attendance of 100+ participants.









**COLLEGE SUPPORT  
& CORPORATE PARTNERSHIP  
STRATEGY**

# NORTHLAND COMMUNITY & TECHNICAL COLLEGE & NORTHLAND FOUNDATION

Northland Community & Technical College is the host institution for the National Center for Autonomous Technologies. They are also supported by the Northland Foundation.

## NORTHLAND

Northland is an innovative leader in higher education, preparing all learners with work and life skills that advance personal well-being and regional prosperity. **Northland is a two-year community and technical college offering 80+ programs in high demand fields including;** Aerospace, Agriculture, Automotive & Transportation, Building Trades, Business & Marketing, Education, Health & Human Services, Information Technology, Law & Public Safety, Manufacturing and more!

Northland President, Dr. Kiddoo supported Experience STEAM and provided remarks as a part of the ribbon cutting ceremony on August 10, 2022. The college supported these initiatives leveraging their expertise across the Business, IT, Facilities, Admissions & Enrollment, and Workforce Development Solutions.



## NORTHLAND FOUNDATION

The mission of the Northland Foundation is **"creating opportunities to invest in the educational experience of Northland's students"**. The Northland Foundation served as the fiscal agent and organizing body for Experience STEAM, providing the necessary support for logistical requirements for executing the event to make it successful. Serving as the conduit for registrations, corporate engagement and contracting event services, the Northland Foundation was able to facilitate processes that were not possible through the standard college procedures.



# CORPORATE ENGAGEMENT

## WHY WE PURSUED CORPORATE FUNDING

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NCAT pursued a corporate partnership strategy in the creation of Experience STEAM to support sustainability of NSF ATE resources and increase financial support to grow the scope of partners.

**The Northland Foundation had the ability to acquire \$122,500 in corporate partnership from Best Buy, Thomson Reuters, Andersen Corp., Mayo Clinic, SpaceTEC, FAA and KOMA Engineering.**

This funding significantly impacted NCAT's ability to offer pre-registered classes at **no cost** to the end user. In doing so, corporate partners directly and dramatically increased the impact of the event by eliminating financial barriers for individuals to participate in high-energy educational opportunities directly tied to technician-level education and employment.

NCAT employed Fox Advancement for their considerable experience in corporate fundraising. NCAT and Fox worked closely to develop a comprehensive strategy to pursue multiple corporate funding streams. After initial research, it was decided to concurrently pursue corporate grant funding and individual corporate funding opportunities.

The inclusion of corporate partners in the STEAM Carnival greatly enhanced the interactive experience and credibility of the STEAM Carnival value proposition. **Best Buy** brought exciting and tactile experiences for younger audiences with their Makey-Makey STEM kits and WowWEE self-balancing robot. **Andersen Corp.** leaned into the carnival aspect with a station where participants could kick a kick-ball against a reinforced window, and **Mayo Clinic** brought an ECG machine to education attendees on the underlying technology.

**Their presence lent inescapable credibility to the general public that tied Experience STEAM to employment opportunities. Beyond simply concepts, Andersen Corp. and the Education & Career Center had direct employment opportunities.**

**Fox Advancement**

Unique Insights. Extraordinary Solutions.







# GRANT FUNDING

## CORPORATE GRANT OPPORTUNITIES

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Fox Advancement created a list of corporate grant opportunities. The selection criteria included organizations with ties to the local Minnesota geographical area or deep connections to the STEAM subject areas central to the event. Both corporate entities and their respective foundations were pursued. Once identified, opportunities were vetted for the Northland Foundation's eligibility, probability of success, application type/deadline, and the ability for NCAT to receive funding by the time of the event.

**Fox Advancement identified and applied for six grants to support Experience STEAM.**

The applications were unsuccessful, but a value-added learning experience. The Northland Foundation and Fox began applying to grant opportunities less than five months before the event. This greatly limited the grants pursued, needing them to be rolling deadlines or funded by July 2022. The fact Experience STEAM was an individual event, not an iterative event or an actual organization, further hurt the chances of success. Finally, the lack of pre-existing relationships with the organization reduced the applications to almost transactional, which greatly reduced acceptance.

**Corporate Grant/Foundation funding is a reliable source of funding for STEAM outreach activities, if approached within an appropriate timeframe, relationship building, and clear use of funds.**



## ABOUT FOX

**Based out of Minneapolis, Minnesota.**

**For the past 24 years, the Fox Advancement team has been writing grants with a win rate of 75%.**

**[foxadvancement.com](https://foxadvancement.com)**

**Fox Advancement**

Unique Insights. Extraordinary Solutions.

# LESSONS LEARNED

## GRANTS & CORPORATE SPONSORSHIPS

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**NCAT had significant lessons learned in both the foundation/grant and individual corporate sponsorship levels.**

- **Timing is critical.** The extremely short timeline for seeking support limited the opportunities available. It's recommended that fundraising efforts begin a minimum of nine months to one year before an event. By coordinating earlier with potential funders, companies can evaluate their available funding and build space in their strategy to pursue an opportunity.
- **Refined messaging and branding are vital** for busy corporate audiences. The ability to succinctly outline the value and operational plan dramatically leads to the probability of success. With support from Fox, **the Northland Foundation was able to generate \$122,500 in corporate support** without traditional marketing documents, relying solely on a compelling vision of a meaningful event.
- **Corporate funders are increasingly viewing themselves agents of change**, and are less concerned about direct impacts to their bottom-line. Thomson Reuters relayed that their corporate strategy is less dependent on STEAM outreach efforts directly correlating to employees at Thomson Reuters. Instead, their organization uses its resources to promote and provide strategic investment in a STEAM-centric ecosystem of formal and informal education, cultural influence, and opportunity generation.



When asked if **Betsy Lulfs from Thomson Reuters** if she would recommend this event sponsorship to other organizations, she said, **“Absolutely! The sponsorship shows an investment in the community and our youth. Bring them together. Talk the talk and walk the walk. Level the playing field for every brain to be activated.”**



THOMSON REUTERS



# REACHING NEW COMMUNITIES & NETWORKS

# MINNESOTA STATE

The Minnesota State Director of Communications facilitated the interaction with staff and leadership at the Minnesota State System Office allowing NCAT to leverage existing networks and contact lists.

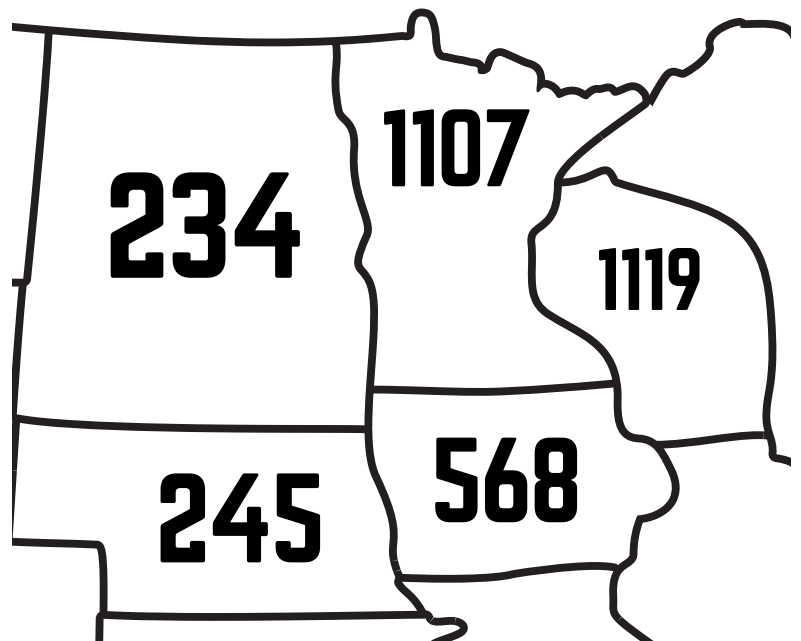
Senior Vice Chancellor for Academic and Student Affairs for Minnesota State distributed event information to the Minnesota Education Dean Alliance (MEDA) - the Deans at the colleges of education and our state universities.

Provided a list of 168 media contacts, many of which are in the Twin Cities, as a good target for disseminating information about Experience STEAM.

MN State Director of Career & Technical Education distributed event information to the Perkins LISTSERV and to all System Office personnel (over 400 people).

Chief Marketing Officer provided us with contact information to the Minnesota homeschool networks.

**Minnesota State Director of Communications provided a list of high school counselors throughout the region, an audience especially interested in this event as a learning opportunity for their students. This led to direct dissemination from NCAT to 3,273 HS counselors.**



**3,273 HIGH SCHOOL COUNSELORS**



# ATE CENTRAL

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NCAT worked with ATE Central to inventory a list of all ATE centers and projects (previous and active) in the surrounding region. The data is rather comprehensive for the last 10-12 years, though older awards may not necessarily appear in this list. This provided a method to disseminate opportunities to participate in the Experience STEAM event including 271 Principal Investigator contacts from:

**NEBRASKA ILLINOIS**

**WISCONSIN**

**MINNESOTA**

**NORTH DAKOTA**

**271**

**PRINCIPAL  
INVESTIGATORS  
REACHED**

**IOWA**

**OHIO**

**KANSAS**

**SOUTH DAKOTA MICHIGAN**

# PARTICIPATION OF UNDERREPRESENTED COMMUNITIES IN STEAM

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Experience STEAM was created with a core principle that education is a key factor in social and economic mobility. NCAT took mindful steps to facilitate and encourage participation among traditionally underrepresented communities including BIPOC, veterans, non-traditional age students, and physically disabled individuals.

## LOCATION

A primary motivator in choosing Mall of America as the venue for Experience STEAM was the unique opportunity to interact with the general public in an inclusive environment.

The natural foot traffic through the Mall includes a broad spectrum of society. **Further, Mall of America is a well-known, easy access, and inclusive space, which helped address perceived social barriers for individuals and groups that may not feel comfortable or have the means to visit a traditional institution of higher education.**

## GROUPS

NCAT worked diligently with a wide variety of organizations to curate a comprehensive outreach list, working to maximize the reach and authenticity of invitations for Experience STEAM. NCAT leveraged existing and new contacts to create an original outreach master-list, then added MOA, Marnita's Table, Fox Advancement, Minnesota State and other partner contacts, to create a cohesive final list.

**Understanding that genuine, heart-felt connection is critical, NCAT staff made personal outreach efforts to these organizations, often working with DE&I experts to create inclusive and culturally relevant invitations.**

## TRANSPORTATION

NCAT worked with Metro Transit to provide free transportation to and from Experience STEAM. This partnership was developed to reduce access barriers to low-income and non-mobile populations. This partnership was heavily featured in outreach efforts amongst identified groups and organizations, including the Best Buy Teen Tech Centers. A more detailed description can be found in the DEI&B portion of this report.

# CONNECT TO DE&I

## ORGANIZATIONS IN STEAM

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**NCAT developed list of 46 organizations across the state of Minnesota that focus on increasing participation in STEM education and careers.**

NCAT cultivated a distribution network of many other nonprofits, community-based organizations, local and regional educator associations, and special interest groups.

NCAT Equity and Inclusion Communications Director worked to develop a list of organizations across the state of Minnesota and the region focused on increasing participation in STEM education and careers. This list was used to engage organizations as potential participants and partners in Experience STEAM and as a dissemination strategy within their networks. Categories of the organizations included:

- Advocacy
- Middle & High School Outreach
- Post-Secondary Student Outreach
- Educators
- STEM Professionals

**One specific partner, Boys and Girls Clubs of Central Minnesota opened up many opportunities to connect with organizations across Minnesota for Experience STEAM and future initiatives. Their club serves lower socio-economically disadvantaged communities and has large African American and Somali community representation.**

**The Boys and Girls clubs sent 20 students to attend the Electric Scooter Build workshop hosted by SpaceTEC and the MakerTEC project. They coordinated for PI, Jonathan Beck to meet with the Boys and Girls Club CEO across Minnesota. They also sent leadership to attend the event to explore future possibilities for connecting their organization to related activities.**

# VOLUNTEER FOCUS

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A total of 450 volunteer positions were needed to make this event successful. Working with partners who are focused on serving underrepresented communities in STEAM and technician education and careers, we **crafted messaging** to corporate affinity groups to participate in the event. Example of welcoming messaging below:

We need YOU! Love science, technology, engineering, arts, or math? Want to help support educators and inspire young people to learn more and get ready for a STEAM career? We need a wide variety of volunteers! You can do one 4.5 hour shift or we'd love to have you with us all week! Want to help, sign up here [ncatech.org/volunteer-sign-up](https://ncatech.org/volunteer-sign-up).

On August 10-14, 2022, we are hosting a 5-day STEAM event at Mall of America, set to spark interest and excitement in science, technology, engineering, arts, and math. The Experience is centered on making meaningful connections and providing valuable content to increase diversity, equity, and inclusion in high-demand advanced technology fields.

Experience STEAM highlights education and career pathways to our emerging skilled technical workforce through hands-on, technology-driven experiences. We would be so appreciative to have your assistance in putting a diverse group of your employees to volunteer for Experience STEAM. Having a broad and diverse cross-section of volunteers will help us inspire and guide the youth in our community on pathways to post-secondary education and a career in the STEAM field.

**We are especially seeking volunteers who live with a disability, are neurodivergent, come from historically marginalized communities, or from underrepresented or underserved ethnicities. To support belonging, it is imperative that young people see themselves embodied, being welcomed, and having bright futures in STEAM professions. We hope that you can join us to serve this role, to inspire youth, and to show that a satisfying and rewarding career in STEAM is possible.**

Yes it's free! Yes you can invite others! Yes you can bring your whole family! Yes the more the merrier! Yes we'd be honored to welcome YOUR group of 5 to 10 volunteers from an organization as part of trust and team building for your organization! Yes this is a great way to expand your own personal and professional networks across difference! Yes this is a great way to introduce young people to career opportunities in your field or organization!



**ALL 450 VOLUNTEER POSITIONS WERE FILLED SUCCESSFULLY!**



# EDUCATION & CAREER CENTER

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The foundational principle for Experience STEAM was to connect hands-on experiential learning to technician education and the associated careers in STEAM related fields. Below is the message format for engaging the Education & Career Center potential partners:

**We are requesting your organization to join us at the Education & Career Center! The purpose is to lend your expertise to Experience STEAM attendees seeking further information on specific aspects of educational and career pathways. You are uniquely qualified to assist attendees who may be interested in specific topic areas and interested in opportunities. Experience STEAM Carnival is from 11AM-6PM August 10-14. We request that you provide staffing for as many hours as practical, and bring any informational materials/brochures that can be referenced and distributed in your absence.**

### **Pillar Area Activation: Education & Career Center**

This is a unified space for Experience STEAM attendees to get the information they need to continue their STEAM journey. It will be the central way-finding assistance and resource area.

### **Way-finding**

Academic/Non-Profit/Corporate partners within the STEAM Carnival will direct participants to the Center for specific way-finding questions of the STEAM Carnival and pre-registered events. It will be the 'home base' for the public face of Experience STEAM.

### **Resources**

The Center will feature a heavy presence of STEAM academic and career pathway resources to assist participants in the next step of their journey. It will be a resource/recruitment area for Minnesota State, NSF ATE, and non-profits.

#### **Minnesota State & NSF ATE:**

Detailed info on academic programs, locations, degree tracks, and timing.

Where participants can go to learn more about the next steps available to them.

#### **STEAM WebMap:**

Collaborative project with The Works & GeoTech of an interactive webmap of STEAM opportunities.

Participants enter zip code for STEAM opportunities.

#### **Scholarships/Financial Aid:**

Resources to help prospective students navigate scholarship and financial aid landscape.

Connecting individuals with resources needed to change their future.







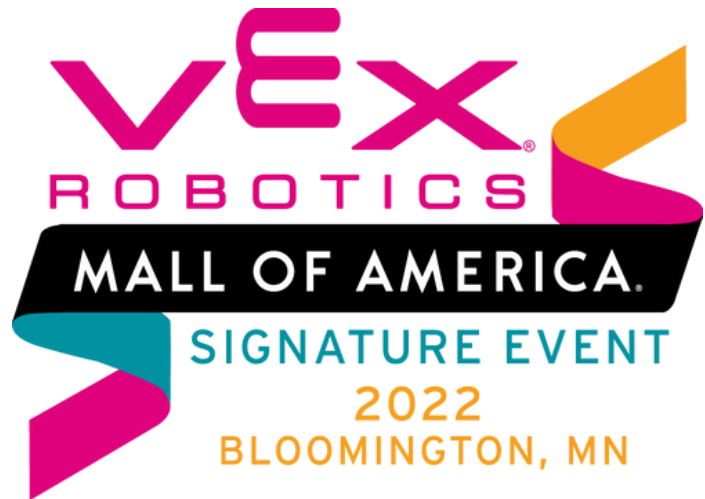
# STUDENT COMPETITIONS

# VEX ROBOTICS

## SIGNATURE EVENT

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For the first time in Mall of America's 30-year history, a live in-person Robotics Competition took place in the North Atrium. Spectators lined around the glass railing on all three levels, including a primary food court, to take in the world-qualifying competition. The Mall of America VEX Signature event was the first VEX Competition of the 2022-2023 season and was full of highly competitive matches between 61 teams from across 20 states and Canada!



**61**  
**TEAMS**

**249**  
**STUDENTS**

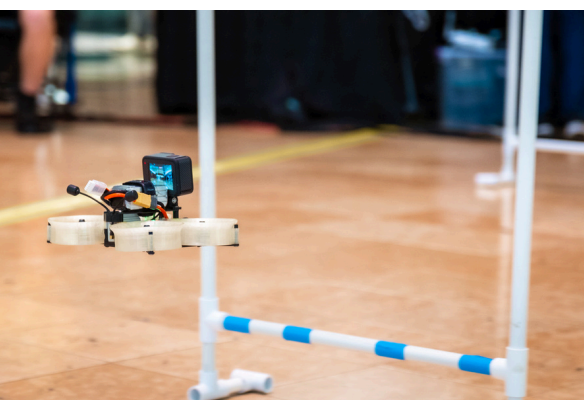
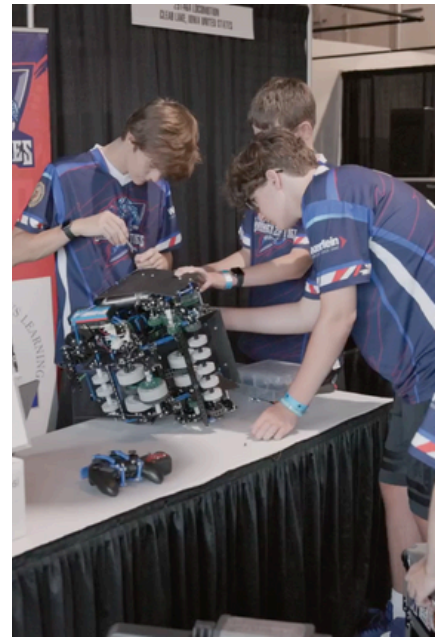
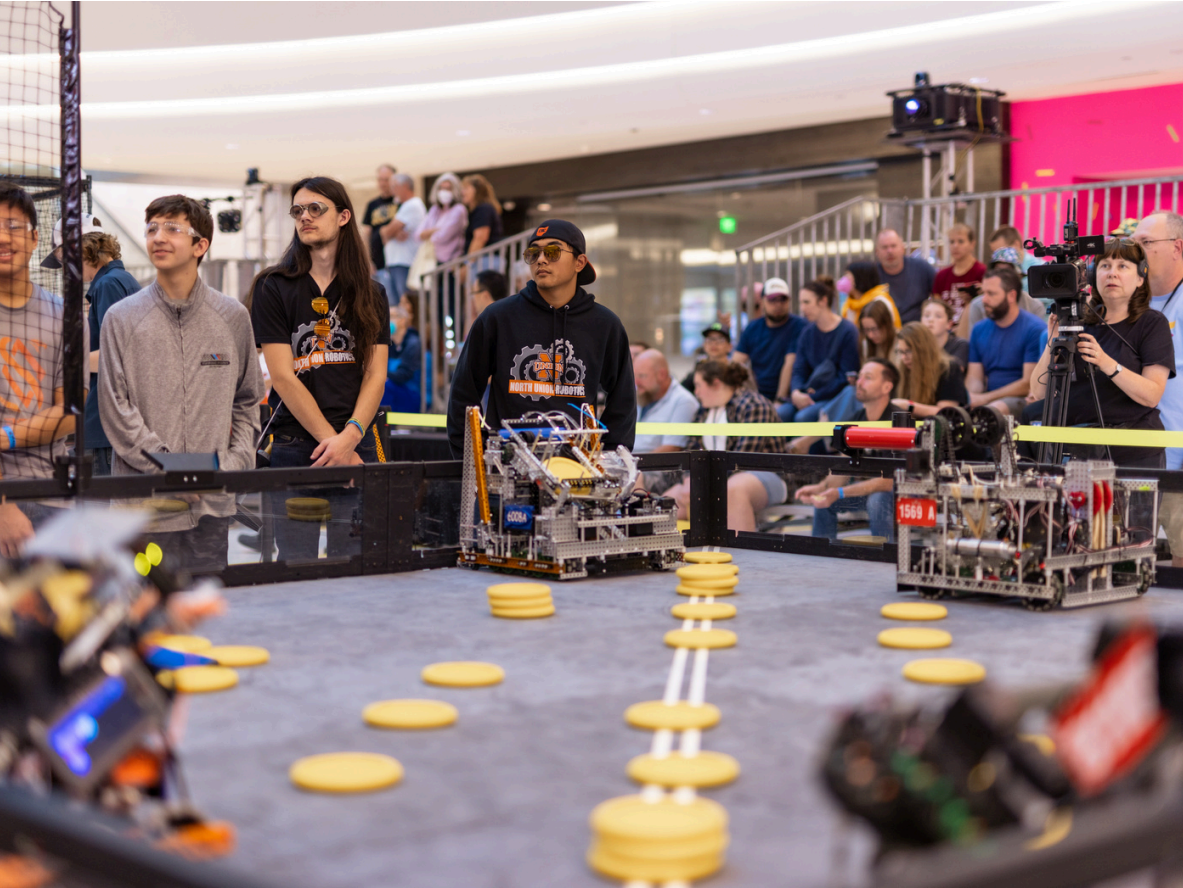
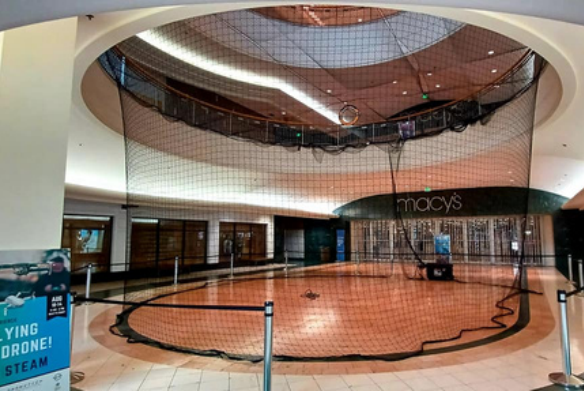
**33**  
**COACHES**

**20**  
**STATES**

**86**  
**VOLUNTEERS**

**2**  
**COUNTRIES**









# YOUTH DRONE

## SPORTS CHAMPIONSHIP



### LIVE DRONE RACING



The Youth Drone Sports Championship takes drone racing to a whole new level. Youth participants create teams and pilot tiny indoor drones through elaborate race courses using first-person view (FPV) goggles.

Youth Drone Sports Championship streams the competitions live to YouTube and Twitch.

**This event had 130 virtual viewers.**



# 14

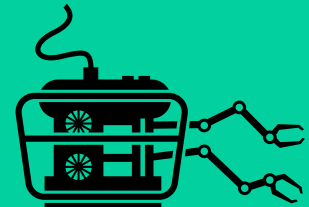
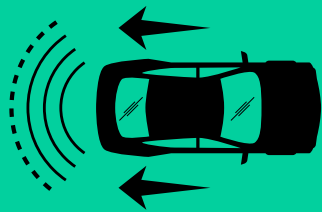
**Students  
Competed**



**UNIQUE**  
IMPACTS &  
SPECIFIC  
**ACTIVITIES**

# AUTONOMOUS TECHNOLOGY ACTIVITIES OFFERED

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- ISA-TOPE - FIRST PUBLIC DEMO
- MNDOT ADVANCED VEHICLE SYSTEMS
- MNDOT ACTIVATIONS
- ADAS 101 CAMP
- EV CERTIFICATION WORKSHOP - SAE BASED
- NCYTE CYBERSECURITY AUTO PENETRATION WORKSHOP
- PLUM CATALYST DEMOS - TESLA, INDIAN MOTORCYCLE, SLINGSHOT
- AUVSI - PARTICIPATION & INTEREST IN WF DEV SUMMIT
- CAAT ACTIVATION

- FLITETEST ACTIVATION & WORKSHOPS
- FAA UAS-CTI PRESENCE
- AUVSI PRESENCE
- LAB MIDWEST ACTIVATIONS
- DRONETECH ACTIVATIONS & WORKSHOPS
- DRONE BUSINESS PLAN COMPETITION
- YOUTH DRONE SPORTS CHAMPIONSHIP
- DRONE CAGE

- MATE 5-DAY PUFFERFISH WORKSHOP
- MATE M8-R SIM SIMULATOR ACTIVATION
- UNDERWATER ROV DEMO

## MUTLI-DOMAIN

- KSA PROJECT
- ROBOTICS EDUCATION & OUTREACH FORUM
- VR & AR EXPERIENCES
- ATE COLLABORATIVE EXHIBIT PROJECT

# DRONE BUSINESS PLAN COMPETITION



The Northland Business Plan Competition is the Minnesota iteration of the National Science Foundation (NSF) Advanced Technological Education (ATE) program (award #192003) project titled "Educating Entrepreneurial Technicians for Unmanned Aerial Systems". Business Plan Competitions under this grant have been held at Sinclair College (Dayton, OH) and Atlantic Cape Community College (Hamilton, NJ).

The Northland Drone BPC included **high-school students interested in two-year technical degrees and underrepresented communities** in addition to the two-year college students in the Sinclair and Atlantic Cape BPC. The 12 students that participated included ten BIPOC students from low-income neighborhoods in Minneapolis, one recently-relocated Afghani Refugee, and one student from rural Minnesota. Keeping with the Experience STEAM guiding principals, this bootcamp was focused on facilitating access to unique opportunities. **Of the 12 students, only a handful had ever been exposed to small unmanned aircraft systems (sUAS) technology, and even fewer had considered starting a business.**



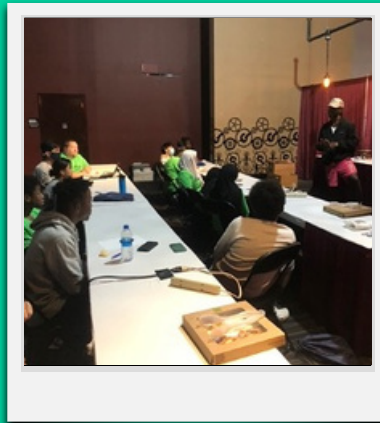
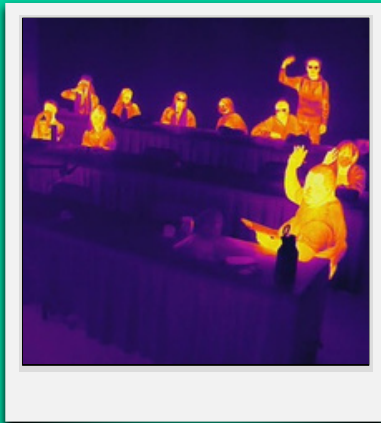
# DRONE BUSINESS PLAN COMPETITION

By facilitating meaningful and personal connections with the guest speakers, the BPC created a framework where **students felt free to be themselves and pursue what interested them**. The four 'businesses' that were pitched at the end were highly reflective of their interests, experiences, and worldview.

- A team of high-school athletes envisioned a drone company flying racing drones amongst players at football games.
- A team led by a lifeguard pitched an autonomous drone that could drop a life preserver to patrol beaches.
- A team that included participants with mothers as nurses created an autonomous rover to deliver medicine to contagious patients, naming the company Nebari, which is a friendly greeting in their home country of Malawi.

The lasting value of the Northland Drone BPC is the **mental shift encouraged by creating an environment where critical thinking and curiosity were encouraged and participants were provided tools for success**. Armed with this expanded worldview, participants can re-enter their communities with the methodology to create meaningful change.

Each student was given an \$800 stipend for attending the competition.



"The Northland Drone Business Plan Competition was impactful because it connected young, inquisitive minds with specific drone and entrepreneurial resources, enabling them to see how they can use emerging technology to better themselves and their communities."

-Aaron Sykes, NCAT STEAM Outreach Coordinator

# FLITE TEST

## WORKSHOPS & CAMPS



Organizations such as Flite Test contributed to the educator workshops and STEAM camp activities. Flite Test offers the FT STEM curriculum, which is an online comprehensive **education program for grades K-12 that is fun, flexible and customizable, developing student STEM skills through a variety of scratch-build aircraft activities.** With access to dozens of ready-to-use lessons, a wide variety of models and materials, hundreds of videos, and a huge community, students will find FT STEM universe a place like no other.



Flite Test has expressed interest in a continued collaboration and recently committed to providing workshops and camps during the Northland Community & Technical College Aerospace Open House event on February 11, 2023!

**Flite Test was created for people passionate about flight. The hope is to encourage people to build and fly, engage, innovate and most importantly having a great time doing it.**

# STUDENT CAMP DEMOGRAPHICS



## Gender Identity

- Male - 75%
- Female - 25%
- Transgender - 0
- Gender Variient - 0
- Not listed - 0
- Prefer not to answer - 0

## Racial Identity

- American Indian or Alaska Native - 0
- Asian - 24%
- Black or African American - 18%
- Hispanic American - 12%
- Native Hawaiian or Other Pacific Islander - 0
- White - 47%

**DIVERSITY AND  
INCLUSION IS  
THE SECRET TO  
INNOVATION**

## Ethnic Identity

- Hispanic or Latino - 24%
- Non-Hispanic or Latino - 76%







# STEAM

## MAPPING PROJECT

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During the event planning process, NCAT uncovered a challenge - funding local STEM organizations. Our purpose was to engage with these groups to raise awareness of the event, request participation in the STEAM Carnival, encourage attendance, and develop a lasting relationship. In short, we couldn't find a single unified source of local STEAM opportunities. If we as STEAM professionals had trouble finding these groups, it is probable students, guardians, and guidance counselors may have trouble as well.

NCAT, along with NCAT Co-PI and Director of the GeoTech Center, Vince DiNoto, worked with SciMathMN, a Minnesota-based STEM nonprofit to create the STEAM Mapping Project. NCAT staff, DiNoto, SciMathMN, and The Works collaborated to strategically leverage GeoTech subject matter expertise to augment existing non-profit efforts to meet a specific community need.

The STEAM Mapping Project currently has a number of STEM organizations and is growing as SciMathMN has used this development to re-engage several other STEM communities.

The STEAM Mapping Project is a success story of selectivity using NSF ATE resources to create capabilities in tangential STEAM communities to encourage STEAM participation and career pathway development.



# KNOWLEDGE, SKILLS & ABILITIES INITIATIVE

## AUTONOMOUS TECHNOLOGY TECHNICIAN STANDARDS

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**Bringing together Subject Matter Experts to develop Autonomous Technology standards across all domains.**

NCAT has initiated a project to extract core knowledge, skills, and abilities, across multiple industry sectors, that incorporate autonomous technologies (AT). As of 2019 there are 941 public, community colleges, in the United States but very few have the programming necessary to produce technicians for the fast paced, high technology, autonomous systems industries.

The primary goal of NCAT's core KSA project is to investigate common curriculum across the air, land and sea domains, in partnership with industry and existing programs.

-  **PHASE ONE** Recruit SME's, dive into subjects that cross domains and develop a document that outlines the KSA's that cross over all domains.
-  **PHASE TWO** Disseminate standard to academic and industry partners for feedback. Once complete, recruit two-year tech colleges to provide program offerings.
-  **PHASE THREE** Develop a Competency Model through Department of Labor. Model would be used to inform content for curricula for both students and educators.

**Experience STEAM provided an opportunity for five SMEs from across different AT fields to come together for Phase One of the initiative. The standard subjects have been categorized into common themes, producing a document that shows correlations across all fields of autonomous technology documented.**

# ROBOTICS

## EDUCATION & OUTREACH FORUM

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The overarching goal for the 2022 Robotics Education & Outreach Forum was to increase communication and collaboration amongst robotics program practitioners and build community. While the 2022 Robotics Education & Outreach Forum was inspired by similar gatherings organized by RoboNation (formerly known as the AUVSI Foundation) in 2010 and 2011, this year the team dove deeper into the following topics:

- Digital badges/micro-credentials
- Centralized, online database(s) of competitions and other robotics-related education programs
- Distance learning engagement strategies
- Coordination and recognition to ensure access to state, federal, and corporate funding mechanisms for robotics education
- Strategies and resources to engage a broader audience of participants in student competitions, specifically focused on diversity, equity, inclusion, and belonging
- The role of robotics competitions and community colleges in technical education and workforce development

### Major Takeaways:

- Branding ourselves as a leadership team - Robotics Education & Outreach Alliance.
- Continue to meet in-person on a regular basis 1-2 times per year.
- Need for centralized, comprehensive database of competition and other robotics-related educational programs. Jill Zande, Josh Neubert, and Lindsey Groak to follow up on this and identify potential sources of funding.
- Research Coordination Networks | Beta site for NSF - National Science Foundation is one potential source of funding for the database and the overall Forum objective of increasing communication and building a collaborative community.
- Dan to share the monthly legislative reports that he receives from consultants monitoring activities such as the 99H Robotics Grant program in an effort to coordinate advocacy for broad inclusion and access.
- We distinguished micro-credentials from digital badges:
  - Micro-credentials - demonstration and assessment of skills and experiences (e.g., Industry Certifications (roboticseducation.org))
  - Digital badge - the manifestation of the certification (the "diploma")

**Dan Mantz, CEO of the REC Foundation, was able to attend the Forum, as well as the VEX Signature Event, featuring 60 teams from across the world. His participation led to an awareness of the ATE program and support of a Minnesota State Institution to collaborate on integrating VEX robotics into an October 2022 ATE project submission. He is also planning to visit NCAT housed at Northland Community & Technical College in the Fall of 2022.**







**DIVERSITY**  
EQUITY  
INCLUSION  
& **BELONGING**



# OUTREACH FOCUS

## TRADITIONALLY UNDERSERVED COMMUNITIES

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By making investments in STEAM outreach into traditionally underserved communities, we create unique framework for innovation that strives for social and economic equity. Simply put, most STEAM professionals (and entrepreneurs) are white, cisgender, and male. By improving access to STEAM concepts, education, and careers, there is an opportunity to create an ecosystem where the sum is greater than the parts. As more people from traditionally underrepresented communities enter the STEAM field, they bring with a unique perspective that will help shape the future of STEAM development within its currently defined tracks.

More importantly, these individuals can leverage their education to address and overcome challenges within their geographical, economic, and cultural communities that are unknown and unknowable to the current majority of STEAM professionals.

Finally, most importantly, is **their participation in STEAM education and careers demonstrates the potential for future generations within their communities. Seeing representation from their communities, aspiring students are given a license to dream at younger ages**, increasing the learning (and earning potential).

## IMIRA! & PARTNERS - LEADING THE WAY

iMIRA! - STEAM Carnival activation in the Rotunda which featured a multitude of hands-on STEM experiments aimed towards a younger audience. Children gravitated towards the display, bringing their parents along.

They first had their picture taken for a custom 'Lead Scientist' badge and were provided a lab coat. iMIRA! then paired the family with a multi-lingual staff member who guided them through the multiple experiments in the attractions, explaining how the science worked in their native language.

Throughout the demonstrations, it was energizing to see the parents start asking questions and become increasingly inquisitive within a language and cultural context they were comfortable with. By the end of the tour, the parents' excitement was on-par with their child's and often requested their own "Lead Scientist" badges to commemorate the experience.





# YOUTH STEAM AMBASSADORS

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## FILLED 450 VOLUNTEER SLOTS

### 270 VOLUNTEER SLOTS FILLED BY 'EARN AS YOU LEARN' YOUTH STEM AMBASSADORS PROGRAM.

Through partnerships with organizations focused on increasing participation of underrepresented communities in STEAM education and careers, Experience STEAM was able to recruit volunteers to fill the 450 positions needed to support the partners.

The project team received mentorship on engaging corporate affinity groups to support the effort that also increased resources to support future opportunities. An affinity group or employee resource group (ERG) is a collection of individuals who share a common identity characteristic, which can be a wide range of things. The unifying characteristic is usually something that's traditionally underrepresented and can make the people in that group feel isolated.

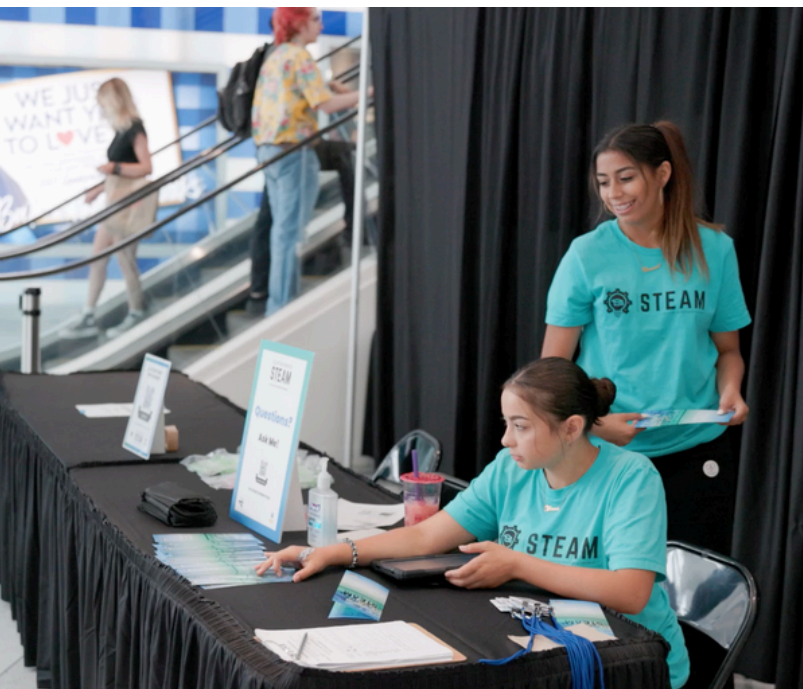
Through partnerships the team recruited an organization to specifically support a Workforce Fellow or Youth STEAM Ambassador program.

The Youth STEAM Ambassador program contributed by filling 270 volunteer positions. Youth STEAM Ambassadors were provided opportunities to work with partners to learn about different advanced technology education and career tracks. **40% of the Youth STEAM Ambassadors were bilingual, with languages spoken including English, Spanish, Nepali, Mandarin, Hmong, French, and Tagalog.**

Through the Experience, they served as leaders in delivering the activities side-by-side with STEAM Carnival Partners. This helped to lower the barriers to seeing technician education opportunities and pathways to related STEAM careers. It also increased public engagement by having youth actively demonstrating their knowledge and creating a relatability for other participants.

**The event held across seven activation areas with leadership representing diverse communities which contributed to the overall atmosphere that was received overwhelmingly positive and welcoming.**







# FREE TRANSPORTATION

## PARTNERSHIP WITH METRO TRANSIT

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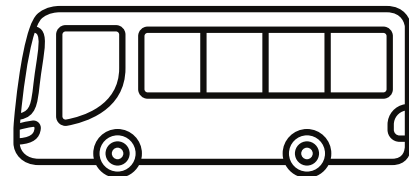
### **NCAT PARTNERED WITH METRO TRANSIT TO PROVIDE FREE TRANSPORTATION TO ANYONE ATTENDING EXPERIENCE STEAM FOR ALL 5-DAYS OF EVENT**

Metro Transit supported Experience STEAM by providing FREE TRANSPORTATION on all five days of the event from 7AM - 7PM. Attendees were provided a link to download a FREE transportation pass to and from Mall of America.

In our approach to create a sense of belonging and design a welcoming space for this event, we engaged Metro Transit as an event partner with the goal to provide free transportation services so that this event was accessible to all members of the community.

Experience STEAM Partners including NSF, Minnesota State, non-profit and community-based organizations were able to actively promote free transportation through direct communication with community organizations, schools and programs for vulnerable youth. In addition, transportation was promoted through the Experience STEAM website, email campaigns, and social media for NCAT, Marnita's Table, and Mall of America.

**This partnership created transportation options which helped eliminate barriers to participation, especially for socio-economic disadvantaged communities.**



**224**  
**TOTAL RIDES**

# UNIQUE OPPORTUNITIES FOR VETERANS

## SPECIAL OPPORTUNITY FOR VETERANS TO PARTICIPATE IN A 3-DAY STEM GUITAR BUILD WORKSHOP

The STEM Guitar Build Project was originally developed to get hands on training back into traditional classroom settings that was lost in the 1990s and 2000s. The approach with teachers is to provide content that replaces traditional curriculum that corresponds with sections of constructing a guitar.

About 5 years ago, the STEM Guitar Project partnered with the American Patriot Music Project which focused on veterans' support and rehabilitation through music and held guitar building workshops with them as a part of the NSF grant. What was discovered is the immersive process of building a guitar in a short period of time significantly impacted the veterans' self-confidence and showed the participants that success can occur with their injuries.



## OPPORTUNITY TO PARTICIPATE IN CAREER & EDUCATION CENTER BOOTH

The Minnesota National Guard was provided with an opportunity to participate in the Career & Education Center booth, which was the main hub for the entire event, located in the Rotunda. Their participation included resources for education and veteran transition programs.





# UNIVERSAL DESIGN FOR LEARNING WORKSHOP

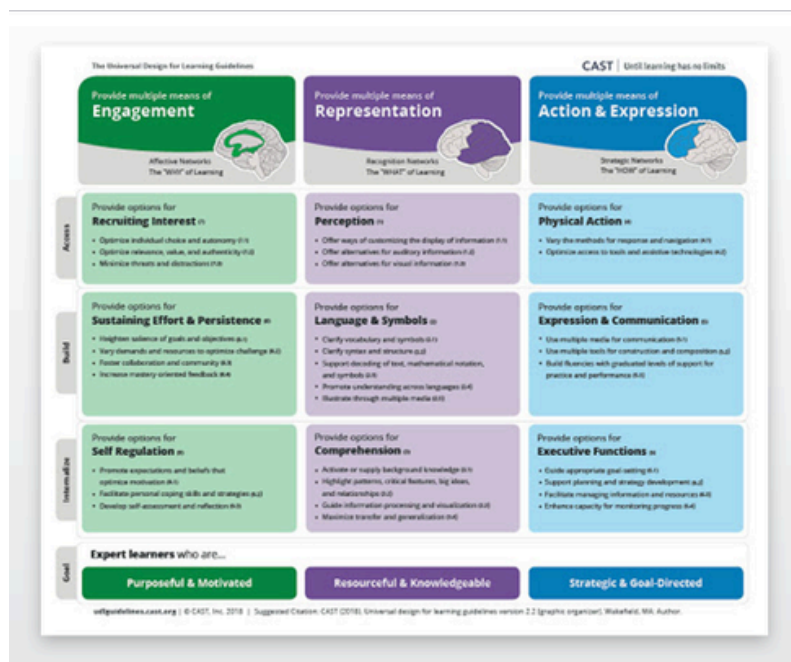


## WORKSHOP GEARED TOWARDS THE PROCESS OF MAKING ACCESSIBLE PROGRAMS

CAST offered a workshop at Experience STEAM that was centered around Universal Design for Learning, a process to make accessible spaces and programs to an increasingly diverse learner population.

CAST, a pioneer and leader in the area of inclusive learning, partners with AccessATE to support the work of the NSF-funded Advanced Technological Education (ATE) projects and centers in making the materials and activities they develop more accessible for all students and faculty, including those with disabilities.

The project aims to increase awareness and understanding of accessibility requirements and provides guidance, tools, and support that offers solutions and helps achieve not just conformance to accessibility best practices, but the design of more flexibly designed environments that celebrate and build on the diversity everyone brings to learning.



**"Universal Design for Learning is one of the few big and truly transformative ideas to emerge in education over the past two decades."**

**- Martha L. Minow**  
Former Harvard Law School  
Dean and Author of Just  
Schools: Pursuing Equality in  
Societies of Difference

# DIVERSITY, EQUITY, INCLUSION & BELONGING

## BEST PRACTICES

VS

## LESSONS LEARNED



- Youth STEAM Ambassador program "earn as you learn" concept created opportunities for youth from underserved populations to earn \$100/4.5 hour shift to assist partners in their hands-on activities and engage with mall guests.
- Implemented website translation feature to remove barriers to non-English speaking members of the community.



- The importance of plainSpeak.
- Understanding cultural history and worldview including pas interactions (or lack of) with formal institutions of higher learning.
- Willingness to listen and learn.
- Genuine connection building for lasting, meaningful relationships to offset the concern they are being 'used to check a box'.
- Clear definitions of scope/expectations to minimize 'lost in translation' differences among cultural groups.



"Working with DEI&B Professionals was an opportunity for growth amongst the NCAT team. The experience helped us better understand the nuanced landscape of working with traditionally underrepresented communities. In order to remove barriers, it was important for us to know and understand what the barriers were. Working with DEI&B organizations not only helped us do that, but engraved the practices into everything we do at NCAT."

- Chelsea Bladow, NCAT Equity & Inclusion Communications Director

**IMPACT DATA**  
EXTENDING OUR  
**REACH**



# SOCIAL MEDIA IMPACT

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NCAT utilized social media to promote Experience STEAM partners, activities, workshops, camps, announcements and to build excitement around the event as a whole. Between NCAT and Mall of America, we were able to make over 895,250 impressions across multiple platforms from April to August.

**637.2K**

NCAT Facebook  
Reach

**148.6K**

MOA Facebook  
Reach

**53.8K**

MOA Instagram  
Impressions

**19.5K**

NCAT Twitter  
Impressions

**895K**

TOTAL  
IMPRESSIONS

**14.7K**

MOA LinkedIn  
Impressions

**14.5K**

MOA Twitter  
Impressions

**4.6K**

NCAT LinkedIn  
Impressions

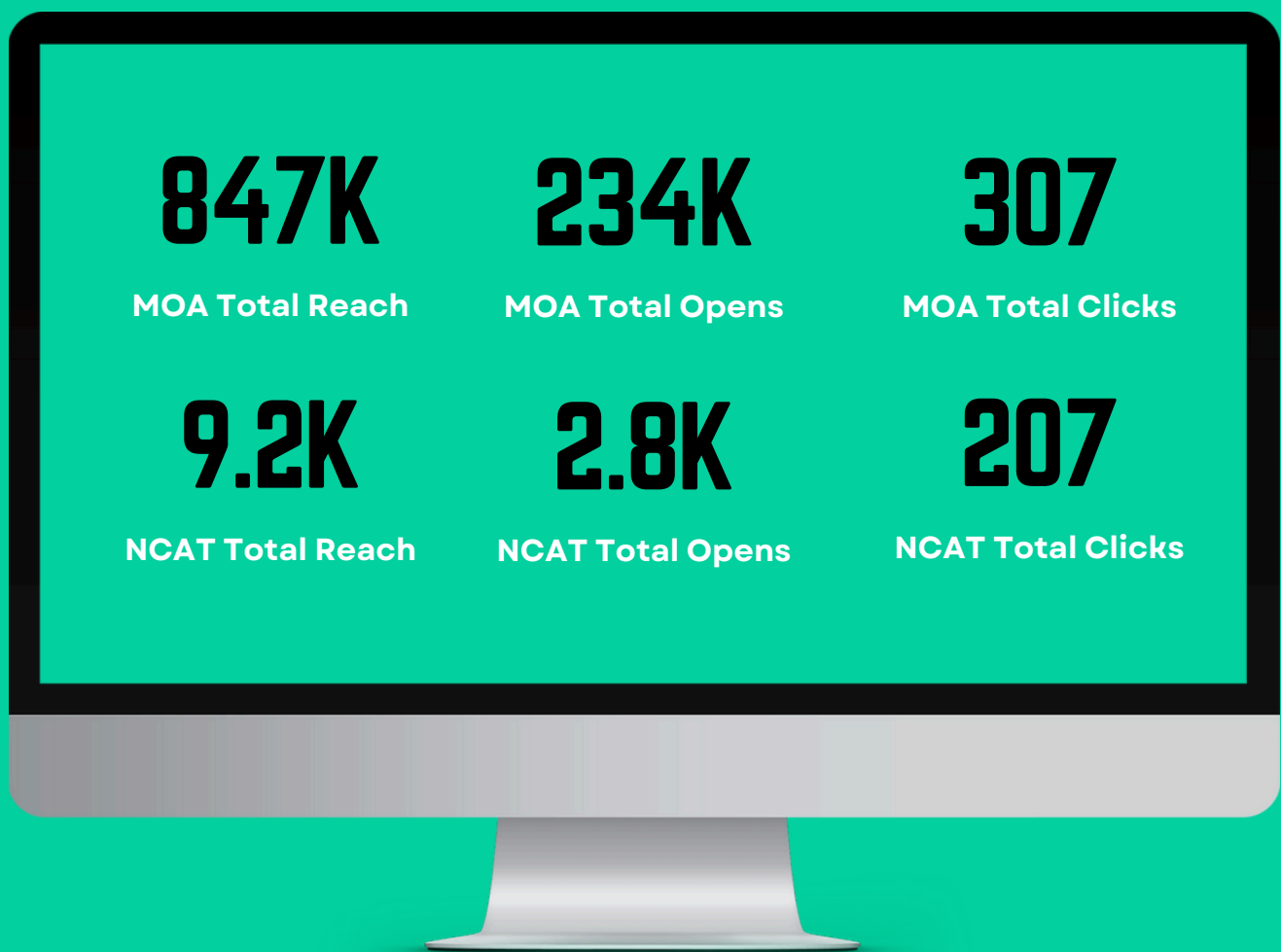
**2.4K**

NCAT Instagram  
Impressions

# EMAIL CAMPAIGNS

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Beyond direct outreach, NCAT and Mall of America utilized email campaigns to reach their audiences about Experience STEAM. Between June and August, NCAT sent out four email campaigns and gained nearly 400 subscribers, bringing the total number of subscribers up to 2,358. Mall of America featured Experience STEAM in five email campaigns, reaching nearly 850,000 people.



# DIGITAL SIGNAGE

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Experience STEAM highlighted partnerships and specific events through digital signage mall-wide. Ads began on June 17 and ran through August 15 and were displayed on the digital halos, digital skyway banners and digital vertical screens making a total impressions of 36,000,000 in 60 days.

The main jumbotron in the Rotunda was utilized throughout the STEAM Carnival hours (11AM-6PM) and featured partner logos, photos, videos and live streaming of the VEX Robotics Signature event and Youth Drone Sports Championship drone racing competition.

**60 DAYS**

**36 MILLION IMPRESSIONS**



# WEBSITE TRAFFIC

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NCAT developed a fully comprehensive event website for Experience STEAM which included information about the event, STEAM Carnival activities, registration information for all workshops and camps, partner information with direct links to their websites, and volunteer sign-up.

Our team received amazing feedback from Mall of America Executives, event partners, and the general public on the user-friendly design and functionality of the website, making it a "one-stop-shop" for everything Experience STEAM.

NCAT seen a tremendous increase (nearly double the average) in page views from April to June, with most traffic being direct and organic.

Mall of America hosted Experience STEAM event information on their homepage (hero) and on their events page.

**51.2K**

**NCAT Page Views**

**143.1K**

**MOA Page Views**

# NEWS & MEDIA

The NCAT Communications Director worked very closely with Mall of America's PR team to gain as much coverage on the event possible. With Mall of America's reputation and direct contacts to the media in the Twin Cities, we were able to leverage our media outreach through Mall of America.



### Publications and Dissemination from the event included:

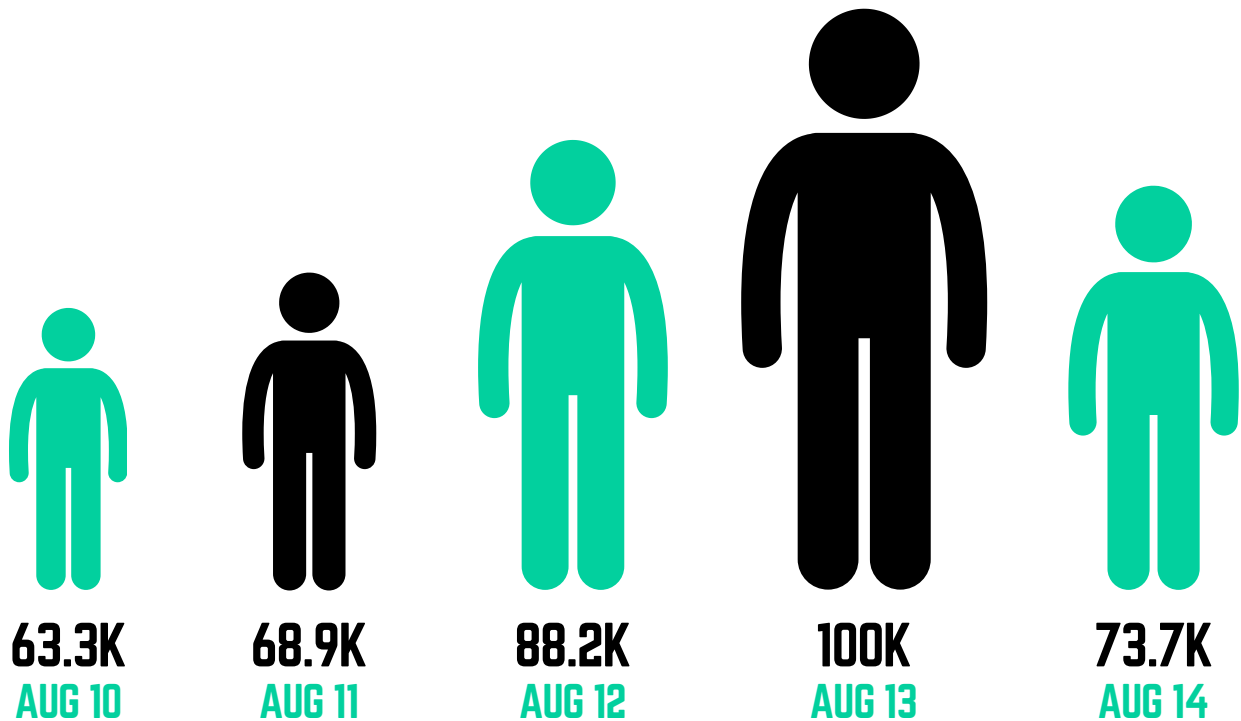
- Community College Journal Newsletter
- Community College Journal Article
- Journal of ATE
- KARE 11 News
- KSTP Broadcasting
- WCCO
- Fox 9 News
- KMSP
- Crookston Times
- Thrifty Minnesota
- and more!



# MALL TRAFFIC

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Mall of America has a system in place to estimate the number of visitors each day. For this 5-day event that ran Wednesday through Sunday, it is estimated that there were a total of nearly 400,000 mall visitors.



**394,120 TOTAL VISITORS**





# **FEEDBACK,** BEST PRACTICES & **LESSONS LEARNED**

# WORKSHOP PARTICIPANT FEEDBACK

80%



## Very likely

How likely are you to use the material you learned in this workshop?

- **Very likely - 80%**
- Likely - 20%
- Not likely - 0%

61%



## Greatly exceeded expectations

Did this workshop meet your expectations?

- **Greatly exceeded - 61%**
- Exceeded - 26%
- Matched - 13%
- Less than - 0
- Much less than - 0

79%



## Strongly agree

The content and materials presented made sense.

- **Strongly agree - 79%**
- Agree - 19%
- Neither agree nor disagree - 2%
- Disagree - 0
- Strongly disagree - 0

100%



## Yes

Would you recommend this workshop to others?

- **Yes - 100%**
- No - 0

87%



## Strongly agree

The workshop instructors were knowledgeable and capable.

- **Strongly agree - 87%**
- Agree - 13%
- Neither agree nor disagree - 0
- Disagree - 0
- Strongly disagree - 0

79%



## Strongly agree

The activities were well planned and meaningful.

- **Strongly agree - 79%**
- Agree - 21%
- Neither agree nor disagree - 0%
- Disagree - 0
- Strongly disagree - 0





"The Pufferfish workshop is likely the best professional development I've ever attended as an educator. I loved all the hands-on opportunities to put myself in my student's place, practice new skills, learn the "why's" and "how's" of the design/build process, make lots of mistakes, fix them, troubleshoot."

"I loved the diverse group of people attending the workshop from around the USA and China. We made many new friends and contacts which was a wonderful, unexpected bonus."

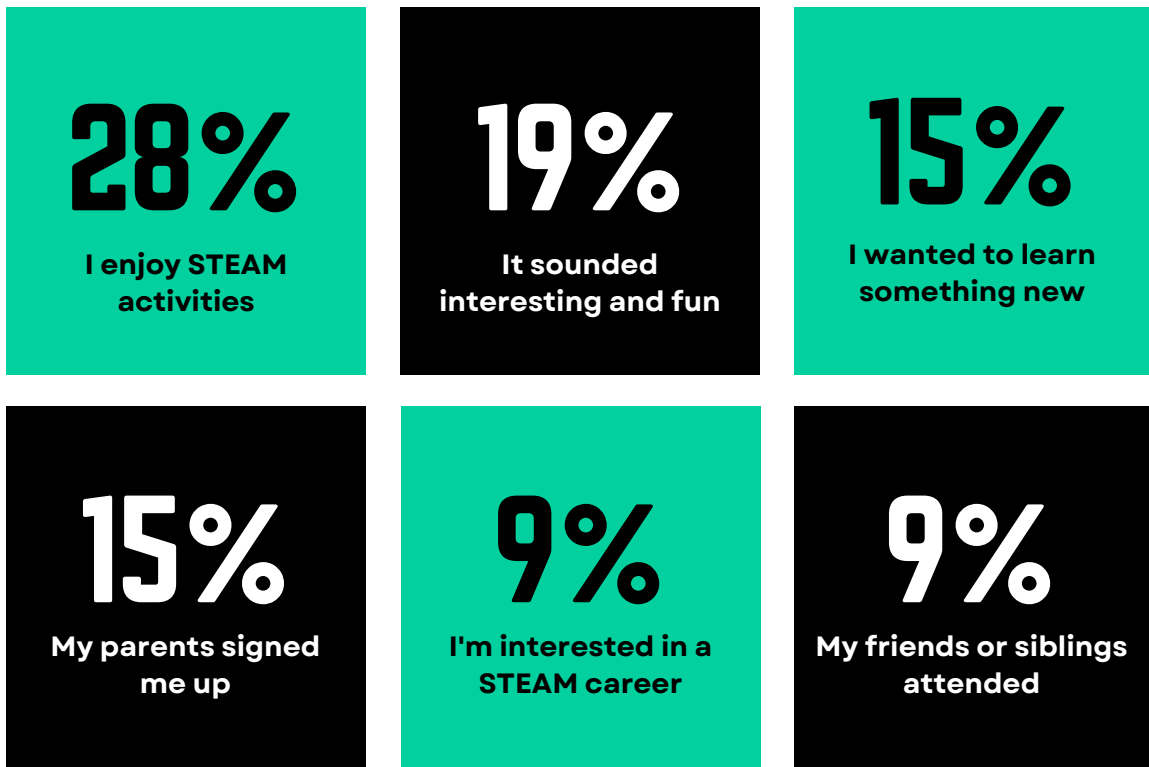
"I am thrilled with the content and skills that I acquired from this workshop. I will be incorporating some of this right off the bat in early September in my "Drones and Geosciences" & "Hydrology" courses."



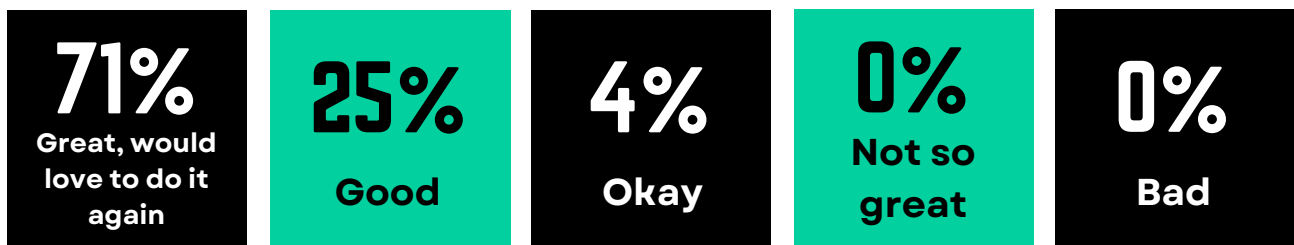
# STUDENT CAMP FEEDBACK

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What interested you most about attending this camp?



Overall, how was your experience at this camp?



# STUDENT CAMP FEEDBACK

In the following areas, rate how much you learned:

Topic	Greatly exceeded expectations	Exceeded expectations	Matched expectations	Less than expected	Much less than expected
Science, Technology, Engineering, Arts, Math	27%	23%	45%	0%	5%
Creating, designing, or building things	48%	22%	26%	4%	0%
How to work in a team	35%	22%	39%	0%	4%
Problem-solving	43%	35%	17%	4%	0%
Potential careers in STEAM	17%	9%	35%	22%	17%

# STUDENT CAMP FEEDBACK

## Prior to attending this camp:

Topic	Not at all interested	Somewhat interested	Interested	Very interested
Were you interested in STEAM?	16%	16%	44%	24%
How interested were you in education an/or careers in STEAM?	12%	28%	36%	24%
Are you more interested in STEAM?	4%	16%	60%	20%
Are you more interested in education and/or careers in STEAM?	8%	21%	42%	29%

Following attending a student camp, 72% of attendees felt more confident in their STEAM abilities.



# STEAM CARNIVAL FEEDBACK

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**73%**



**Very Good**

How would you rate Experience STEAM?

- **Very good - 73%**
- Good - 20%
- Okay - 7%
- Bad - 0
- Very bad - 0

**85%**



**Yes**

Did you learn anything new about STEAM Careers?

- **Yes - 85%**
- No - 8%
- Maybe - 7%

**85%**



**Yes**

Did you stop in the Education & Career Center for information?

- **Yes - 67%**
- No - 33%

**93%**



**Yes**

Would you like to see this event return to Mall of America?

- **Yes - 93%**
- No - 0
- Maybe - 7%

# EVENT COORDINATION

Experience STEAM was a first-of-its-kind-event with a tremendous amount of challenges and successes. We believe that between the best practices and lessons learned, a great framework for similar NSF ATE events in other markets has been built.

## BEST PRACTICES



- **Dedicated info booth for all STEAM Carnival spaces was an absolute necessity, providing a stationary point for volunteer check-in, guest questions, giveaways and partner questions.**
- **Pre-event virtual session that included hospitality training for all partners and volunteers. This is a great way to get questions answered to the entire group and to learn how each person/organization is contributing to the event.**
- **All spaces, including classrooms were easily accessible. Locations with directions of how to get there were included in all of the Mall's kiosks.**
- **Leveraging Mall of America's media contacts to get full coverage of the event (local and national).**

VS

## LESSONS LEARNED



- **In short, more time was needed to plan this event. Start planning 10-12 months in advance with event planner on board.**
- **Get messaging for the event out sooner to key target audiences (secondary & post-secondary schools, youth groups, non-profits serving underrepresented communities) to build momentum earlier and more often.**
- **Plan an in-person partner/volunteer kick-off event to allow for networking and questions.**
- **Event host handle all workshop/camp registrations instead of individual organizations. This will keep outgoing communication to participants streamlined and consistent.**

# ACKNOWLEDGEMENTS

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Thank you so much for making Experience STEAM a remarkable success! It was a delight and privilege to work with each and every one of you and your organizations.

- NCAT Team

**WE THANK YOU**  
FOR YOUR SUPPORT OF  
**EXPERIENCE STEAM**

**NATIONAL CENTER FOR AUTONOMOUS TECHNOLOGIES**  
Northland Community & Technical College  
13892 Airport Drive | Thief River Falls, MN 56701  
ncat@northlandcollege.edu | 218.683.8801 | ncatech.org

# EXPERIENCE STEAM PARTNERS

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- 7 Generation Games
- AgCentric
- Anderson Windows
- ATE Collaborative Exhibits
- AUVSI
- Best Buy
- Big Ideas Inc.
- Bloomington Public Schools
- Bolten & Menk
- MN State Adv Manf COE
- CAAT
- CAST
- Central MN Jobs & Training Serv
- Clemson University CUCWD
- Code Savvy
- CQN/MIRA!
- Federal Aviation Administration
- First Robotics
- Flite Test LLC
- Fond du Lac Tribal College
- Fox Advancement
- GeoTech
- KOMA
- LAB Midwest
- Mall of America
- Marnita's Table
- MATE Inspiration for Innovation
- MatEdU
- Mayo Clinic
- Metro State University
- Metro Transit
- Micro-Nano Tech Ed Center
- MnDOT
- Minnesota National Guard
- MN Recruiting & Ret Battalion
- Minnesota State
- MN State Eng COE
- MN State Southern Ag COE
- MN State Transportation COE
- MN STEM Partnership
- MN West Comm & Tech College
- NCAT
- NCyTE
- NextGen Manufacturing
- Northland Comm & Tech College
- Plum Catalyst
- Public Math
- Sinclair College - STEM Guitar
- Southeast Service Co-op
- SpaceTec
- St. Cloud State University
- St. Cloud Tech & Comm College
- Stagetime Productions
- Thomson Reuters
- TRF Youth Robotics
- VEX Minnesota
- Youth Drone Sports Championship





# NSF ATE PARTNERS

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- **360° Manufacturing (DUE 1204550)**
- **AgCentric (DUE 2000787)**
- **ATE Collaborative Exhibits (DUE 2032738, 1261914)**
- **Center for Advanced Automotive Technology (DUE 1400593)**
- **CA2VES (DUE 1104181, 1501695)**
- **GeoTech (DUE 2202038)**
- **ISA-TOPE (2054997)**
- **MakerTEC (DUE 1601710)**
- **MATE Inspiration for Innovation (DUE 1104310, 1502046)**
- **MatEdU (DUE 1400619, 2000347)**
- **Micro-Nano Technology Education Center (DUE 2000281)**
- **National Center for Autonomous Technologies (DUE 1902574)**
- **NCyTE (DUE 2054724, 1800589, 1902329)**
- **National Center for Next Generation Manufacturing (DUE 2055767, 1933277)**
- **Normandale Community College (DUE 1700624)**
- **Northland Comm & Tech College DRONETECH & UAS GIT (DUE 1700615, 1501629)**
- **Sinclair College - STEM Guitar Project (DUE 1700531)**
- **SCCAP (DUE 1303935)**
- **SpaceTEC (DUE 1303935)**
- **St. Cloud Tech & Comm College - Immersive Learning Project (DUE 2202206)**





**E X P E R I E N C E**  
**STEAM**

**[ advanced technological education ]**