



**A61 STEM Outreach – Conduct Science Technology
Engineering and Math (STEM) Outreach to Minority K-12
Students Using Unmanned Aircraft Systems (UAS) as a
Learning Platform
(STEM IV)**

December 4, 2023

NOTICE

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The U.S. Government assumes no liability for the contents or use thereof. The U.S. Government does not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the objective of this report. The findings and conclusions in this report are those of the author(s) and do not necessarily represent the views of the funding agency. This document does not constitute FAA policy. Consult the FAA sponsoring organization listed on the Technical Documentation page as to its use.

LEGAL DISCLAIMER

The information provided herein may include content supplied by third parties. Although the data and information contained herein has been produced or processed from sources believed to be reliable, the Federal Aviation Administration makes no warranty, expressed or implied, regarding the accuracy, adequacy, completeness, legality, reliability or usefulness of any information, conclusions or recommendations provided herein. Distribution of the information contained herein does not constitute an endorsement or warranty of the data or information provided herein by the Federal Aviation Administration or the U.S. Department of Transportation. Neither the Federal Aviation Administration nor the U.S. Department of Transportation shall be held liable for any improper or incorrect use of the information contained herein and assumes no responsibility for anyone's use of the information. The Federal Aviation Administration and U.S. Department of Transportation shall not be liable for any claim for any loss, harm, or other damages arising from access to or use of data or information, including without limitation any direct, indirect, incidental, exemplary, special or consequential damages, even if advised of the possibility of such damages. The Federal Aviation Administration shall not be liable to anyone for any decision made or action taken, or not taken, in reliance on the information contained herein.

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. A11L.UAS.53 (A61) Final Report	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle A61 STEM Outreach – Conduct Science Technology Engineering and Math (STEM) Outreach to Minority K-12 Students Using Unmanned Aircraft Systems (UAS) as a Learning Platform (STEM IV)	5. Report Date December 4, 2023		6. Performing Organization Code
	8. Performing Organization Report No.		
7. Author(s) Daniel Findley, https://orcid.org/0000-0003-4929-8613 Evan Arnold, https://orcid.org/0000-0002-7725-9067 Kurt Carraway, https://orcid.org/0000-0002-1362-8177 Jacob Kimerer, https://orcid.org/0009-0004-5419-1903 Katie Silas, https://orcid.org/0000-0003-0647-4592 Shanna Walker, https://orcid.org/0009-0006-8178-9059 Spencer Schrader, https://orcid.org/0000-0002-6243-6315 Andrew Shepherd, https://orcid.org/0000-0003-4083-4846			
9. Performing Organization Name and Address North Carolina State University 909 Capability Dr., Raleigh, NC 27603 Kansas State University 2310 Centennial Rd., Salina, KS 67401 Sinclair College 444 West Third Street, Dayton, OH 45402	10. Work Unit No.		11. Contract or Grant No. A11L.UAS.53 (A61)
	13. Type of Report and Period Covered Final Report (August 16, 2022 to December 16, 2023)		
12. Sponsoring Agency Name and Address Federal Aviation Administration FAA Tech Monitor: Bhanu Kota, ANG-C21 UAS COE PM: Karen Davis, ANG-C2	14. Sponsoring Agency Code 5401		
	15. Supplementary Notes		
16. Abstract The fourth phase of the FAA's support for the Center of Excellence, ASSURE, to perform STEM outreach included three institutions: North Carolina State University, Kansas State University, and Sinclair College. Each of these schools was tasked with organizing multiple UAS centric STEM events in the form of Roadshows and Summer Camps, with the opportunity to support other events as appropriate. These programs were able to leverage previous ASSURE STEM work, as well as use the program as an opportunity to showcase the breadth of research performed by the COE, while maintaining individual flexibility in terms of the exact style and methodology for each event. In accordance with the expressed desire from the FAA in the proposal the team endeavored to include students from all manner of diverse socio-economic backgrounds from elementary, middle, and high school age groups with great success. The regional nature of this work encouraged such inclusivity. The final outreach totaled more than 21,000 students, teachers, and other participants in nearly 100 unique events across five states, a remarkable accomplishment for the program and the communities involved.			
17. Key Words STEM, Outreach, Education, K-12, Elementary School, Middle School, High School, UAS, Aviation, Workforce Development		18. Distribution Statement No restrictions.	
19. Security Classification (of this report) Unclassified	20. Security Classification (of this page) Unclassified	21. No. of Pages 26	22. Price

TABLE OF CONTENTS

NOTICE.....	I
LEGAL DISCLAIMER.....	II
TECHNICAL REPORT DOCUMENTATION PAGE.....	III
TABLE OF FIGURES.....	V
TABLE OF TABLES.....	VI
TABLE OF ACRONYMS.....	VII
EXECUTIVE SUMMARY.....	VIII
1 INTRODUCTION & BACKGROUND.....	1
1.1 Purpose.....	1
1.2 Scope.....	1
2 PROGRAM OVERVIEW AND EFFORTS.....	2
2.1 North Carolina State University.....	2
2.1.1 NCSU Planned Approach.....	2
2.1.2 NC DOT Aviation Career Education Academies.....	4
2.1.3 NCSU Summary and Demographics.....	4
2.2 Kansas State University.....	5
2.2.1 KSU Planned Approach.....	5
2.2.2 UAS Roadshows.....	6
2.2.3 Summer Camps.....	7
2.2.4 Outreach.....	9
2.2.5 KSU Summary and Demographics.....	11
2.3 Sinclair College.....	14
2.3.1 Sinclair Planned Approach.....	14
2.3.2 UAS Roadshows.....	14
2.3.3 UAS Camps.....	18
2.3.4 Sinclair Summary and Demographics.....	20
3 CONCLUSIONS.....	20
4 REFERENCES.....	20
5 APPENDIX A.....	21
6 APPENDIX B.....	26

TABLE OF FIGURES

Figure 1. Drone Group Photo from the TRIO Summer Camp Program at NCSU.	3
Figure 2. Reedy Creek Magnet Middle School Mechatronics Course.	3
Figure 3. NCDOT ACE Academy Student Demographics.	5
Figure 4. Eisenhower Middle School Assembly.....	7
Figure 5. Southeast Salina Roadshow.....	7
Figure 6. Frontier Middle School Students Earning their TRUST Certificate.	8
Figure 7. Students at Frontier Flying the TinyHawk.	8
Figure 8. A group of Frontier Students Flying the TinyHawk.	9
Figure 9. Team Logo for The Cougar Pilots.....	10
Figure 10. Championship Track	11
Figure 11. Rosedale, Kansas City, USD 500.....	12
Figure 12. Frontier Schools, USD 33, Kansas City.....	12
Figure 13. Topeka Schools, USD 501 Demographics.....	12
Figure 14. Great Bend, USD 482.....	13
Figure 15. Salina Schools, USD 305.	13
Figure 16. Southeast of Saline, USD 306.	13
Figure 17. School District Wage Compared to State Wage and National Wage.....	14
Figure 18. Collage 1 of Sinclair Roadshow Events.....	15
Figure 19. Collage 2 of Sinclair Roadshow Events.....	16
Figure 20. Collage 3 of Sinclair Roadshow Events.....	17
Figure 21. Collage 4 of Sinclair Roadshow Events.....	18
Figure 22. Collage 1 of Sinclair Summer Camps.....	19
Figure 23. Collage 2 of Sinclair Summer Camps.....	20

TABLE OF TABLES

Table 1. Summary of Outreach Activities by School.	viii
Table 2. A61 STEM IV Complete Event List.....	21
Table 3. Previous STEM Project Summary.....	26

TABLE OF ACRONYMS

ACE	Aviation Career Academy
AMA	Academy of Model Aeronautics
ASSURE	Alliance for System Safety of UAS through Research Excellence
COE	Center of Excellence
DOA	Division of Aviation
DOT	Department of Transportation
FAA	Federal Aviation Administration
K-12	Kindergarten through 12 th Grade
KSU	Kansas State University
NCSU	North Carolina State University
STEM	Science, Technology, Engineering, and Math
TRUST	The Recreational UAS Safety Test
UAS	Unmanned Aircraft Systems
USD	Unified School District

EXECUTIVE SUMMARY

The Federal Aviation Administration (FAA) continues to prioritize Workforce Development through the support of the Center of Excellence (COE) for Unmanned Aircraft Systems (UAS) by providing funding that goes directly towards generating interest and excitement about UAS and aviation in local elementary, middle, and high school aged children throughout the United States. In this project, the fourth phase of funding through the COE directed towards Science, Technology, Engineering, and Math (STEM) outreach, the FAA tasked three universities with integrating UAS as a learning platform in both new and existing youth events, as well as facilitating the distribution of the cutting-edge research being performed by the entire COE. As with the previous phases of this work, specific emphasis was placed on increasing diversity, equity, and inclusion in the STEM, UAS, and aviation disciplines.

A61 STEM IV was led by North Carolina State University (NCSU) and included Kansas State University (KSU) and Sinclair College as part of the team. Sinclair had previously supported Phase III, while both NCSU and KSU were first time participants in the COE STEM program. Each school planned, coordinated, and executed their own approach to fulfilling the requirements of the project: at least one Summer Camp and two UAS Roadshow events. This flexibility allowed each school to consider the unique effects of their region and the students diverse backgrounds in the design of each activity. Without this flexibility, it would have been impossible to create such an appropriately engaging and challenging environment to stimulate interest in these technical fields.

Table 1 highlights the significant impact this program had in reaching just over 21,000 students, teachers, and other participants. With just 16 months to plan and perform this program, the research team has done a wonderful job in executing 97 events across the UAS Summer Camps, UAS Roadshows, and other opportunities including community-based events, airshows, etc. The support from the FAA, the previous STEM work performed by each of the member institutions, as well as the full body of research from the COE all contributed to making this project so impactful.

Table 1. Summary of Outreach Activities by School.

School	Events	Participants
NCSU	21	835
KSU	39	16,439
Sinclair	37	3,735
Total	97	21,009

1 INTRODUCTION & BACKGROUND

The Federal Aviation Administration’s (FAA) continued support for the Center of Excellence (COE) for Unmanned Aircraft Systems (UAS) – the Alliance for System Safety of UAS through Research Excellence (ASSURE) – in outreach and the dissemination of the body of research has allowed for yet another phase of Science, Technology, Engineering, and Math (STEM) efforts. This report details what is commonly referred to as project A61 STEM IV. The FAA grant amendment authorizing the project entitled: *A61 - Conduct Science Technology Engineering and Math (STEM) Outreach to Minority K-12 Students Using Unmanned Aircraft Systems (UAS) as a Learning Platform* was issued on August 16, 2022, with a 16-month period of performance and a completion date of December 16, 2023. The new phase of funding involved two schools not previously engaged in the ASSURE related STEM outreach projects, North Carolina State University (NCSU) and Kansas State University (KSU), further expanding the overall program’s reach throughout the country.

1.1 Purpose

While the STEM field has more job opportunities and often higher wages, key groups, such as women and minorities, are underrepresented in STEM. Moreover, the workforce requirements in STEM, aviation, and the unmanned systems fields are expected to continue to grow, requiring a consistent student base from which to draw the next generation of professionals in those disciplines. To make STEM opportunities more accessible to underrepresented groups and to contribute to the interest in the UAS field, the FAA has supported ASSURE in conducting STEM activities using UAS as the central learning platform. This project falls within the COE’s mandate to educate and strategically facilitate the distribution of ASSURE research.

1.2 Scope

As outlined in the proposal, each school was expected to plan and support multiple events of various types throughout the A61 STEM IV program. The three categories of supported initiatives were UAS Roadshows, UAS Summer Camps, and to support dynamic opportunities throughout the duration of the project, an optional category for other UAS activities deemed appropriate. The expectation of Roadshows was shorter duration events, possibly occurring throughout the school year on weekends. Summer Camps were more in-depth and extended opportunities for outreach. At least two Roadshows and one Summer Camp event were part of the original tasking, with all the participants exceeding those requirements. With the beginning of the project being after the outset of the Fall Semester 2022, most of the first months were used for planning and laying the groundwork for the events in the Spring, Summer, and Fall of 2023.

The following best practices were to be used in the STEM activities and taken from the proposal:

1. Culturally representative approaches will be used. The building blocks will be modified to address specific cultural communities. This will require an understanding of the underlying dynamics of each area and why certain groups are under-represented.
2. Representative, diverse role models will be used for each event.
3. Existing networks and resources will be leveraged to the best extent possible.
4. Active/participatory learning approaches will be used.
5. All activities will be age appropriate.

2 PROGRAM OVERVIEW AND EFFORTS

A61 STEM IV was performed by three different schools with three different approaches toward STEM. This effort had activities that fell into three basic categories:

1. UAS Roadshows
2. UAS centered summer camps
3. Ad Hoc UAS Outreach Events

The program by school were as follows:

- North Carolina State University (NCSU)
- Kansas State University (KSU)
- Sinclair College (Sinclair)

The following section depicts each school's efforts with highlights to specific programs.

2.1 North Carolina State University

NCSU, the lead university for this effort, handled the programmatic support for the project through technical interchange meetings and semi-annual program management review updates. NCSU was already active in K-12 STEM education through myriad on and off campus programs. This funding allowed for increased capacity and a greater focus on UAS and aviation subjects within the broader STEM initiatives. In addition, many NCSU programs already supported the FAA's focus on minority and under-resourced communities with respect to diversity in STEM fields.

2.1.1 NCSU Planned Approach

In partnership with the NC Department of Transportation's (DOT's) Division of Aviation (DOA), NCSU supported the Aviation Career Education (ACE) Academies to serve as UAS Roadshow events. This grant program hosts middle and high school students at local public airports in North Carolina. Many of these camps took place in rural regions and counties and highlighted the aviation industry, UAS, and related fields of study and work opportunities in those communities.

Two summer camp programs were supported through this project, both of which are ongoing university initiatives. The TRIO Pre-college program at NCSU hosts a STEM Summer Camp for under-resourced high school students from across North Carolina. Figure 1 shows a drone photo from the TRIO program. This program is one of only three others nationwide approved to host a Future Ready Scholars Academy. While these camps are traditionally based on broad STEM topics, this funding increased the focus on aviation, UAS, and career opportunities in those industries. The Science House is another on-campus outreach unit with several STEM opportunities for middle and high school students. One of which, the Catalyst program, provides both weeklong summer camps and Saturday activities during the school year to students with disabilities. The priority is to help educate and prepare these students to participate in a growing STEM workforce.



Figure 1. Drone Group Photo from the TRIO Summer Camp Program at NCSU.

Finally, NCSU was able to work with a local school, Reedy Creek Magnet Middle, to expand the UAS curriculum in their Mechatronics courses. Through five days of combined instructional and hands on experience, these students were able to learn basic aerodynamic and aviation principles and fly multiple UAS platforms under direct supervision of a Part 107 pilot.



Figure 2. Reedy Creek Magnet Middle School Mechatronics Course.

2.1.2 NC DOT Aviation Career Education Academies

Building upon the strong foundation of partnership between NCSU and the NC DOT's Division of Aviation, this effort supported ten ACE Academies held at a range of public airports throughout North Carolina. Below is an excerpt from the 2023 ACE Academy Report from NC DOT:

“North Carolina’s public airports helped inspire the next generation of talent to pursue careers in aviation during summer 2023 by hosting aviation-focused Aviation Career Education Academies for elementary, middle, and high school students.

The NC Department of Transportation Division of Aviation supports these summer academies with technical assistance, presentations, and funding of up to \$3,000 per academy.

The ten public airports hosting academies in 2023 exposed a diverse mix of nearly 400 students from across the state to career opportunities in the rapidly changing world of air transportation.

Students got back-stage passes to their local airports and the companies that operate on them. They learned about aviation careers from local pilots, air traffic controllers, civil air patrol members, manufacturers and military and civilian aircraft mechanics. They witnessed parachute jumps, sat inside aircraft cockpits, took the controls of aircraft simulators, and built and flew hot air balloons. They learned flight theory and how to interpret weather.

NC DOT Aviation showcased aviation career and education opportunities in North Carolina for students at each academy, offered hands-on demonstrations of drone operations and shared how NC DOT uses drones to increase safety and inefficiency and save money.”

2.1.3 NCSU Summary and Demographics

For the ACE Academies, each host airport was requested to submit reports that included demographic information. In the interest of student safety and privacy, specific race data was not always obtainable and so the data is presented in a binary fashion based on both race and gender in Figure 3. Two of the camps only reported students’ age by school level, and so those 30 students are unrepresented in this data set. By embedding these camps in local communities, many of them in rural parts of the state, the camps were able to recruit students from a variety of socio-economic backgrounds.

NCDOT ACE Academy Student Demographics

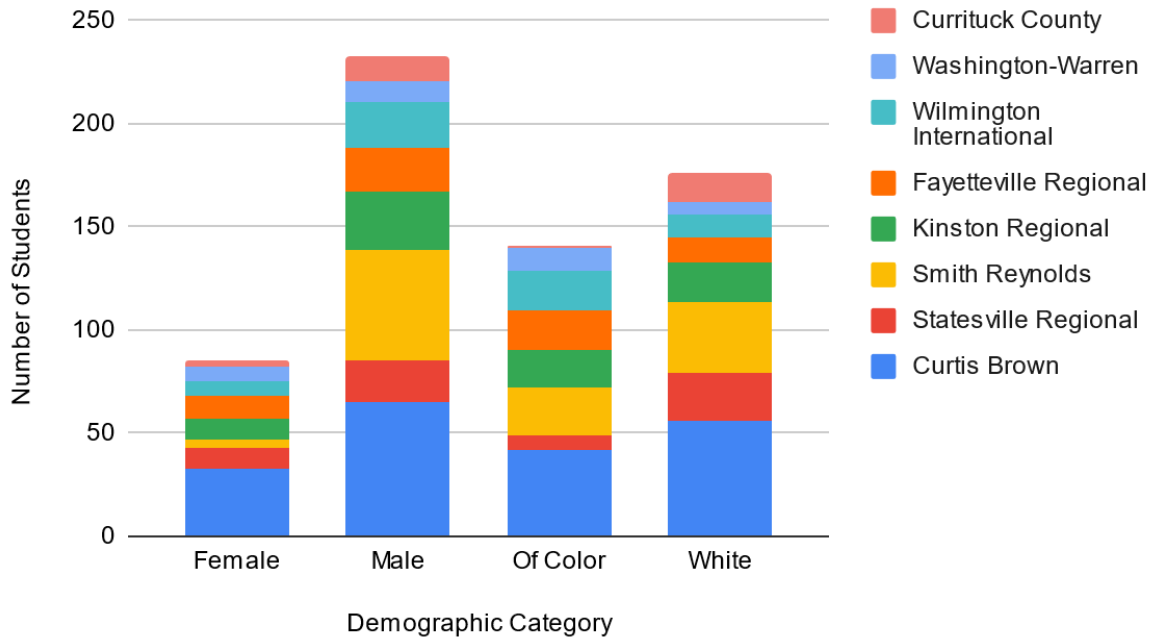


Figure 3. NCDOT ACE Academy Student Demographics.

2.2 Kansas State University

Most employees in STEM fields are comprised of white males; the aviation industry is no exception. To help draw a more diverse level of interest in aviation career options, KSU proposed a mix of virtual and face-to-face engagements with middle school teachers and students from underrepresented communities in the state of Kansas. KSU targeted partnerships with schools with large percentages of Hispanic and Black students.

2.2.1 KSU Planned Approach

The objective was to motivate the next generation of UAS pilots and aviation leaders by exposing middle-school students to UAS recreational activities and career options. Student learning outcomes included: comprehending fundamentals of safe flight operations; understanding the delineation between hobbyist and commercial operations; successfully completing the FAA Recreational UAS Safety Test to become a recreational flyer; exploring recreational flyer and modeler community-based organizations in their local area; building, maintaining, and flying micro drone racing kits indoors; exploring basic flight fundamentals on a multirotor UAS; and participating in friendly competitions within their school and other schools. Ultimately, eight schools were selected in Kansas City, Topeka, and Salina.

For the primary match component of this project, KSU was awarded \$98,281 in Strategic Investment Funds from the university. These funds focused on helping secondary school teachers bring UAS into their schools. The approach involved three primary components: teacher cohort, train the teacher, and teacher stipends.

2.2.1.1 Teacher Cohort

Hosting a teacher cohort in the summer of 2023 and summer of 2024. This five-day program prepares teachers to successfully earn their Part 107 Remote Pilot in Command certificate, with exams being taken at the FAA-designated test center on campus on day four. It also included approximately four hours of hands-on multi-rotor flight experience with a KSU flight instructor.

2.2.1.2 Train the Teacher

Hosting a “train the teacher” cohort in the summer of 2024. This will involve training teachers who already have their Part 107 Remote Pilot in Command Certificate to be multi-rotor flight instructors. Upon completion of the course, teachers will be certified to serve as flight instructors of KSU’s UAS 115 flight training course, giving their students opportunities for dual college credit.

2.2.1.3 Teacher Stipends

A \$2,000 stipend was provided to the teachers partnering with KSU on A61. Additionally, in order to help with KSU’s UAS Department’s outreach efforts, KSU modified a staff position to include a role as UAS STEM coordinator. This point of contact was involved in the UAS Roadshows described below, but also supported other outreach activities, including school visits and presentations, airshow attendance, and other activities.

2.2.2 UAS Roadshows

During the Spring 2023 semester, KSU traveled to multiple schools in Kansas City, Topeka, and Salina to introduce UAS to middle school students. These Roadshows allowed students and educators to better understand commercially used UAS and the various career opportunities. The roadshows served as a means of identifying eight schools that would benefit from the addition of a UAS curriculum. KSU used this opportunity to introduce the Drones in School program to educators and showcase its benefits. KSU procured two Startup Packages from Drones in School and a Race Gate Bundle to demonstrate how a race is flown at the roadshows and some of the equipment provided. Figures 4 and 5 show some of the KSU roadshows.

Figure 4 displays one of the Roadshow Assemblies conducted at Eisenhower Middle School in which a member of the KSU team flew an Autel EVO II aircraft. Students viewed the Autel EVO’s live feed via the projector.



Figure 4. Eisenhower Middle School Assembly.

In Figure 5, a KSU team member is presenting to a class at Southeast of Saline Middle School on the DJI M300 aircraft.



Figure 5. Southeast Salina Roadshow.

2.2.3 Summer Camps

Building on the roadshow experience, KSU visited partner schools in Kansas City, Topeka, and Salina for a series of two-day camps. Holding summer camps at the schools' locations facilitated student and teacher travel logistics while maximizing available KSU resources to provide them with a fun, exciting, and informative experience. Summer camps consisted of two-day sessions with students learning and doing activities. During camp, students earned their FAA **The Recreational UAS Safety Test (TRUST) Certificate**, as seen in Figure 6. Students learned about

Academy of Model Aeronautics (AMA) fields, learned drone safety, flew simulations, and learned basic aerodynamics.



Figure 6. Frontier Middle School Students Earning their TRUST Certificate.



Figure 7. Students at Frontier Flying the TinyHawk.



Figure 8. A group of Frontier Students Flying the TinyHawk.

During the Summer Camps, students were able to experience flying the Emax Tinyhawk III FPV Racing Drone that they would be racing if they participated in the Drones in School Program, as seen in Figures 7 and 8. To prepare for STEM outreach, the teachers at designated partner schools were trained in the Drones in School curriculum to allow them to plan on implementing it into their curricula or incorporating it into after-school programs for the Fall 2023 semester. Two schools have integrated the Drones in School program into their regular curriculum, while the other six schools instituted the program as an extracurricular club activity.

2.2.4 Outreach

During the Fall 2023 semester, the pre-selected schools began the Drones in School UAS curriculum, focused on the Emax Tinyhawk III FPV Racing Drone. The curriculum revolves around core STEM components while simultaneously allowing flexibility in accommodating different focus areas, school and student resources, and adjustments to the included competition aspect. Students were placed into teams of two to six members consisting of a Project Manager, Manufacturing Engineer, Design Engineer, Drone Technician, Graphic Designer, and Marketing Coordinator. Members worked together to complete milestones leading up to a race and continued improving as they progressed through the semester. The curriculum includes sections on project management, electricity, circuits and antennas, and the basics of drone flight.

The layout of this curriculum guided students through a close representation of how a business formulates an idea, research solutions, tests selected solutions, markets a product, and improves the design based on needs. Team names from the partnering schools included: The Flying Cougars, The Eagles, The Flying Jags, Dronerz, Wiingz, The Rats, Girly Pops, and the Cougar Pilots. Figure 9 shows the team logo for The Cougar Pilots.



Figure 9. Team Logo for The Cougar Pilots.

Other champion titles include Design and Engineering, Portfolio and Team Display, and Marketing Video Champion. With each event, teams must complete and submit an engineering and design task, create a portfolio and team display, and produce a marketing video. Judges will assess these elements using a provided scoring sheet and announce winners at the end of each event. During the final events in November 2023, KSU traveled to each school assist with judging the various components. The Championship Track can be seen in Figure 10, where the red and blue circles on the floor represent the start and end points of the track with four race gates. The area marked off with blue painters' tape is the race area in which the TinyHawk must stay.



Figure 10. Championship Track

2.2.5 KSU Summary and Demographics

Overall, the KSU approach was successful as multiple school districts and hundreds of middle school students were reached through roadshow visits and summer camps, allowing those present to learn about the importance and utilization of small UAS for hobbyists and commercial operations. The students in the program were able to learn valuable life skills through the Drones in School Curriculum in a fun and competitive way.

The KSU approach focused on the inclusion of diverse schools and school districts in the state of Kansas; Figures 11-17 provide a detailed overview of the demographics for each of the six school districts in which the partnering schools are from. The demographic information includes the Race/Ethnicity breakdown, along with the total population, the median household income, and the total number of households in the district (ACS School District Profile, 2021).

The schools in Kansas City had the most diverse group of students, as seen in Figures 11 and 12. The most diverse school in the program was Rosedale Middle from Unified School District (USD) 500, with 30% of the population being Caucasian, 24% black or African American, 35% Hispanic, 6% Asian, 1% other, and 4% identified as two or more races. Figure 17 compares the annual average household income of the six school districts compared to the state and national average income levels.

 Total Population
119,250

 Median Household Income | 
\$45,975

 Total Households
43,433

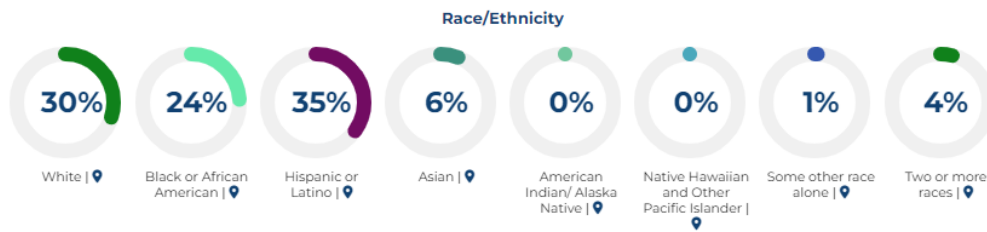


Figure 11. Rosedale, Kansas City, USD 500.

 Total Population
202,227

 Median Household Income | 
\$49,168

 Total Households
91,090

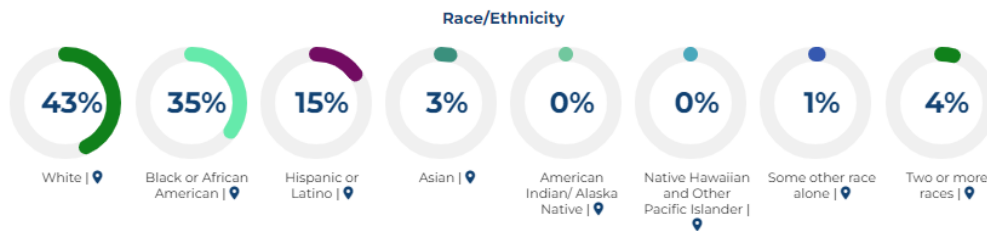


Figure 12. Frontier Schools, USD 33, Kansas City.

 Total Population
95,256

 Median Household Income | 
\$46,921

 Total Households
41,073

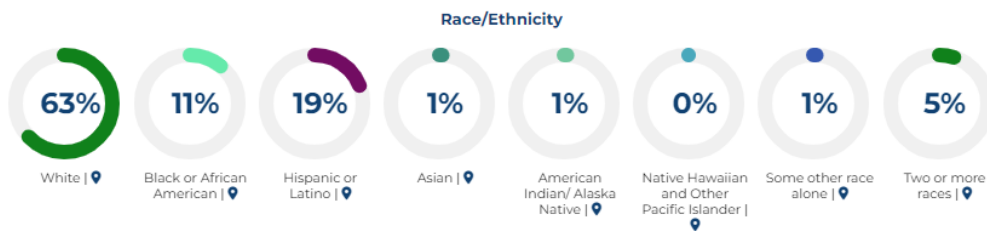


Figure 13. Topeka Schools, USD 501 Demographics.

 Total Population
17,447

 Median Household Income | 
\$50,108

 Total Households
6,890

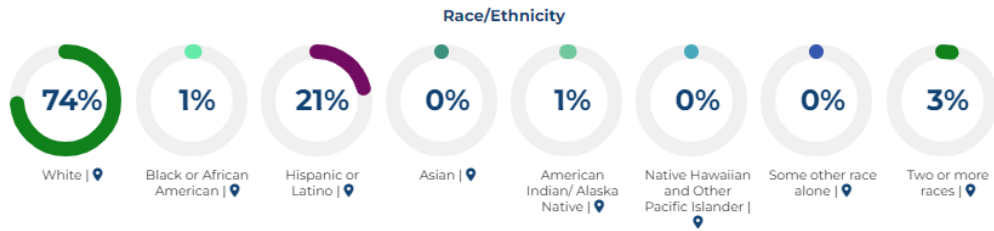


Figure 14. Great Bend, USD 482.

 Total Population
48,690

 Median Household Income | 
\$53,448

 Total Households
19,835

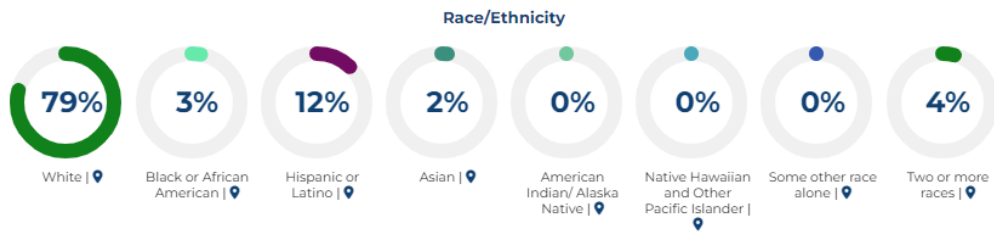


Figure 15. Salina Schools, USD 305.

 Total Population
2,898

 Median Household Income | 
\$75,250

 Total Households
1,118

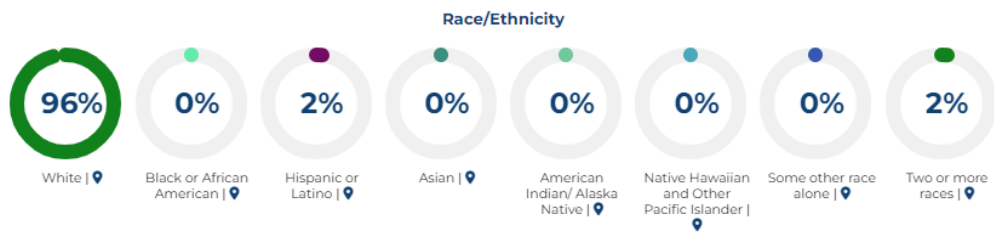


Figure 16. Southeast of Saline, USD 306.

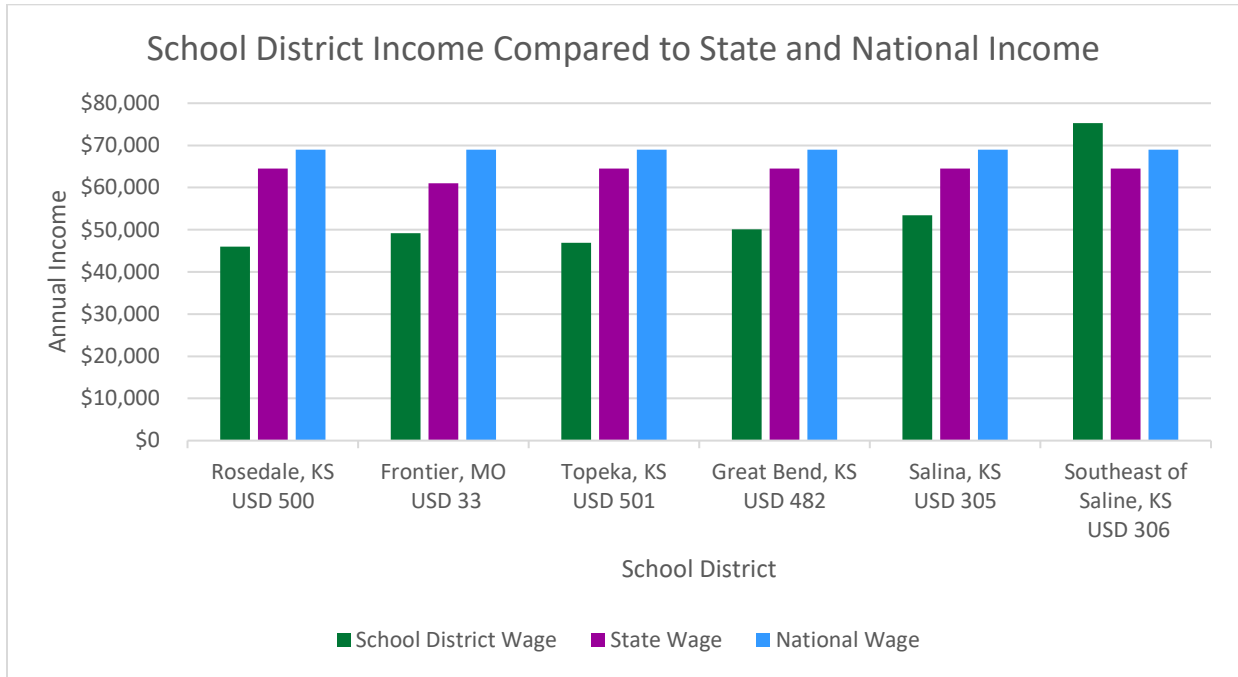


Figure 17. School District Wage Compared to State Wage and National Wage.

2.3 Sinclair College

Sinclair College, enabled through its National UAS Training and Certification Center, remains very active in UAS related STEM education. This has been partially supported through the ASSURE A29 STEM III and A61 STEM IV projects, as well as participation in many separate college hosted events or off-campus camps and hands-on activities. Support through the A61 STEM IV project enabled Sinclair to expand efforts, reaching diverse students through directly hosted events and collaborations with partnering organizations.

2.3.1 Sinclair Planned Approach

Sinclair continued roadshow engagements in middle-school classrooms, as well as at museum and community events, through provision of UAS applications, technologies, and careers briefings, coupled with RealFlight UAS simulation experiences leveraging Sinclair laptops or deployed Mobile or Tactical Ground Control Station vehicles. The network of schools and sites developed throughout the STEM III effort was leveraged to identify locations for these opportunities during the STEM IV project. Additionally, the college hosted or supported aviation and UAS focused camps in partnership with local STEM focused organizations. Of note, highlights of ASSURE research projects were included in the presentation portions of each event to raise awareness of the important work occurring through the COE.

2.3.2 UAS Roadshows

During the project, Sinclair completed 20 outreach days at middle and high schools reaching 2,345 students. Sinclair also completed five outreach days during TechFest hosted at Sinclair, the Micro Drone Races hosted at the National Museum of the United States Air Force, and the Northeast Ohio Regional Airport Aviation Career Day reaching an additional 955 students. Figures 18-21 show a myriad of photos from Sinclair’s Roadshow events.



Figure 18. Collage 1 of Sinclair Roadshow Events.



Figure 19. Collage 2 of Sinclair Roadshow Events.



Figure 20. Collage 3 of Sinclair Roadshow Events.



Figure 21. Collage 4 of Sinclair Roadshow Events.

2.3.3 UAS Camps

Sinclair organized and hosted UAS focused camps coordinated with various organizations to facilitate the Dayton Early College Academy Drone Camp; Air Camp Elementary School, Middle School, High School, and Teacher Camps; Wright Brothers Institute High School UAS Camp; and WACO Aviation Learning Center Middle and High School Drone Camps. These 12 separate camps occurred over 15 dates reaching 338 students and 97 teachers. These camps included presentations showcasing UAS related applications, careers, and technologies in addition to highlights from ASSURE research projects. The various camps also included UAS, advanced air mobility, sensor, wind tunnel, data analytics, simulation, virtual reality, augmented reality, additive and subtractive manufacturing, and other demonstrations and hands-on activities as appropriate to each venue and participants. Figures 22 and 23 show highlights of the summer camps.



Figure 22. Collage 1 of Sinclair Summer Camps.



Figure 23. Collage 2 of Sinclair Summer Camps.

2.3.4 Sinclair Summary and Demographics

Over the duration of the A61 STEM IV effort, Sinclair engaged with 3,735 students, teachers, and members of the broader public throughout Ohio between October 2022 and August 2023. More specific demographic information related to age, ethnicity, gender, or other metrics were not collected or provided by collaborating organizations due to concerns related to privacy and consent.

3 CONCLUSIONS

This fourth phase of STEM funding was a tremendous success for ASSURE and the partner schools involved: North Carolina State University, Kansas State University, and Sinclair College. Dozens of events across Ohio, Kansas, North Carolina, Missouri, and Arkansas, stretching from urban campuses to rural areas, reached more than 20,000 students and teachers. This outreach makes it the largest to date in terms of total participation in ASSURE STEM programs, a staggering feat for just over one calendar year. The dedication to including diverse students from myriad backgrounds enriched each opportunity by providing unique perspectives on the challenges faced in the classroom and in flight.

4 REFERENCES

ACS School District Profile 2017- 2021. (2021).
<https://nces.ed.gov/Programs/Edge/ACSDashboard>

5 APPENDIX A

Table 2. A61 STEM IV Complete Event List.

School	Accomplishment (title)	Date Completed	Location	Number of Students	Number of Educators
A61 TOTAL	97			20912	97
NCSU Total	21			835	0
KSU Total	39			16439	0
Sinclair Total	37			3638	97
NCSU	Civil Air Patrol Youth Cadets - Intro to UAS	2/4/2023	Raleigh, NC	14	N/A
NCSU	Reedy Creek Mechatronics Class	2/22/2023	Raleigh, NC	30	N/A
NCSU	NC DOT DOA Hangar Tour	4/14/2023	Raleigh, NC	40	N/A
NCSU	Global Transpark STEM Event	4/26/2023	Kinston, NC	200	N/A
NCSU	ACE Academy	6/8/2023	Curtis Brown Field Airport	49	N/A
NCSU	ACE Academy	6/12/2023	Henderson Oxford Airport	15	N/A
NCSU	Science House Drone Camp	6/13/2023	Raleigh, NC	20	N/A
NCSU	ACE Academy	6/23/2023	Henderson Oxford Airport	15	N/A
NCSU	ACE Academy	6/26/2023	Statesville Regional Airport	30	N/A
NCSU	Science House Drone Camp	6/27/2023	Raleigh, NC	20	N/A
NCSU	ACE Academy	6/27/2023	Smith Reynolds Airport	29	N/A
NCSU	ACE Academy	6/29/2023	Curtis Brown Field Airport	49	N/A
NCSU	ACE Academy	7/10/2023	Kinston Regional Jetport	38	N/A
NCSU	NAF Future Ready Summer Camp	7/12-7/13	Raleigh, NC	39	N/A
NCSU	ACE Academy	7/17/2023	Currituck County Regional Airport	15	N/A
NCSU	ACE Academy	7/18/2023	Washington-Warren Airport	67	N/A
NCSU	NCSU Incoming Freshmen Engineering	7/28/2023	Raleigh, NC	50	N/A

NCSU	ACE Academy	8/3/2023	Wilmington International Airport	30	N/A
NCSU	ACE Academy	8/8/2023	Fayetteville Regional Airport	32	N/A
NCSU	2023 Drone & Air Show, Washington – Warren (OCW)	10/13-14	Washington, NC	10	N/A
NCSU	Elon Drone Day	11/3	Elon, NC	43	N/A
KSU	Roadshow- Greenbush Summer Camp	7/11/2023	Lawrence, KS	50	N/A
KSU	KC Airshow	9/2-9/4	Kansas City, KS	400	N/A
KSU	Har-Ber/Springdale High College Fair	9/15/2023	Springdale, AR	3000	N/A
KSU	Classroom visits at Har-Ber High	9/16/2023	Springdale, AR	100	N/A
KSU	MGS Fall Festival	10/31/2023	Minneapolis, KS	60	N/A
KSU	McConnell Airshow	9/24-9/25	Wichita, KS	600	N/A
KSU	TWIST (Teen Women In Science & Technology)	1/5/2023	Salina, KS	150	N/A
KSU	Sunset Elementary STEM Night	2/28/2023	Salina, KS	100	N/A
KSU	Roadshow	3/28/2023	Conway Springs, KS	145	N/A
KSU	Roadshow	4/11/2023	Solomon, KS	120	N/A
KSU	Ad Astra Kansas Space Celebration	4/22/2023	Topeka, KS	300	N/A
KSU	Roadshow-Rosedale Middle School	4/24/2023	Kansas City, KS	175	N/A
KSU	Flint Hills Discovery Center	5/6/2023	Manhattan, KS	5,500	N/A
KSU	Roadshow- Eisenhower Middle School	5/17/2023	Topeka, KS	350	N/A
KSU	Roadshow- Chase Middle School	5/19/2023	Topeka, KS	400	N/A
KSU	Aviation Summer Camp-KSU	6/5/2023	Salina, KS	20	N/A
KSU	Summer Camp-Rosedale Middle School	6/5 - 6/6	Kansas City, KS	15	N/A
KSU	Aviation Summer Camp-KSU	6/6/2023	Salina, KS	20	N/A
KSU	4-H Career Exploration Discovery Day	6/8/2023	Manhattan, KS	40	N/A
KSU	STARBASE Rockets & Robots Camp	6/8/2023	Salina, KS	30	N/A

KSU	STARASE Flight School Camp	6/12 - 6/13	Salina, KS	25	N/A
KSU	STARBASE Summer Camp	6/15/2023	Salina, KS	25	N/A
KSU	Summer Camp – Topeka Schools	6/22 - 6/23	Topeka, KS	12	N/A
KSU	Summer Camp- Frontier	6/26 - 6/27	Kansas City, MO	24	N/A
KSU	Summer Camp-Great Bend	7/6-7/7	Great Bend, KS	8	N/A
KSU	Flint Hills Discover Center	7/18-7/19	Manhattan, KS	1,700	N/A
KSU	STARBASE	6/9/22-10/12/23	Salina, KS	1,000	N/A
KSU	KC Airshow	8/19-8/20	Kansas City, KS	100	N/A
KSU	Flint Hills Discovery Center – Aerospace Day	8/26/2023	Manhattan, KS	1,700	N/A
KSU	Girls in Aviation Day	9/30/2023	Salina, KS	75	N/A
KSU	Southeast of Saline School Visits	10/5/2023	Salina, KS	30	N/A
KSU	Great Bend Middle School Visit	10/16/2023	Great Bend, KS	10	N/A
KSU	Sunset Elementary STEM Night	10/24/2023	Salina, KS	23	N/A
KSU	STARBASE Spooktacular STEM Night	10/26/2023	Salina, KS	25	N/A
KSU	MGS Fall Festival	10/31/2023	Minneapolis, KS	45	N/A
KSU	Classroom visits at Frontier	11/1-11/3	Kansas City, MO	18	N/A
KSU	Classroom visits at Rosedale	11/2/2023	Kansas City, KS	4	N/A
KSU	Upward Bound STEM Day	11/11/2023	Salina, KS	10	N/A
KSU	Kaw Valley School District Career Day	11/17/2023	St. Marys, KS	30	N/A
Sinclair	Cedar Cliff Middle School UAS STEM Outreach	10/26/2022	Cedarville, OH	46	N/A
Sinclair	Coy Middle School UAS STEM Outreach	11/2/2022	Xenia, OH	164	N/A
Sinclair	Coy Middle School UAS STEM Outreach	11/3/2022	Xenia, OH	165	N/A
Sinclair	Ankeney Middle School UAS STEM Outreach	11/8/2022	Beavercreek, OH	128	N/A
Sinclair	Ankeney Middle School UAS STEM Outreach	11/9/2022	Beavercreek, OH	72	N/A
Sinclair	Greeneview Middle School UAS STEM Outreach	11/16/2022	Jamestown, OH	101	N/A
Sinclair	Greene County ESC UAS STEM Outreach	12/6/2022	Yellow Springs, OH	31	N/A

Sinclair	Bellbrook Middle School UAS STEM Outreach	12/15/2022	Bellbrook, OH	53	N/A
Sinclair	Baker Middle School UAS STEM Outreach	1/4/2023	Fairborn, OH	139	N/A
Sinclair	Baker Middle School UAS STEM Outreach	1/5/2023	Fairborn, OH	129	N/A
Sinclair	Warner Middle School UAS STEM Outreach	1/18/2023	Xenia, OH	86	N/A
Sinclair	Warner Middle School UAS STEM Outreach	1/19/2023	Xenia, OH	88	N/A
Sinclair	Warner Middle School UAS STEM Outreach	1/20/2023	Xenia, OH	80	N/A
Sinclair	Bellbrook ESC UAS STEM Outreach	1/30/2023	Bellbrook, OH	22	N/A
Sinclair	Mills Lawn Elementary School UAS STEM Outreach	1/31/2023	Yellow Springs, OH	39	N/A
Sinclair	TechFest (Sinclair College)	2/18/2023	Dayton, OH	180	N/A
Sinclair	TechFest (Sinclair College)	2/19/2023	Dayton, OH	280	N/A
Sinclair	Micro Drone Races (National Museum of the USAF)	2/25/2023	Riverside, OH	165	N/A
Sinclair	Micro Drone Races (National Museum of the USAF)	2/26/2023	Riverside, OH	80	N/A
Sinclair	Springboro High School STEM Day UAS STEM Outreach	3/20/2023	Springboro, OH	350	N/A
Sinclair	Kettering Middle School	3/21/2023	Kettering, OH	99	N/A
Sinclair	Kettering Middle School	3/22/2023	Kettering, OH	107	N/A
Sinclair	Kettering Middle School	3/23/2023	Kettering, OH	96	N/A
Sinclair	Lebanon High School Future Career Fair STEM Outreach	4/12/2023	Lebanon, OH	350	N/A
Sinclair	High School Aviation Career Day	5/18/2023	Jefferson, OH	250	N/A
Sinclair	Dayton Early College Academy Drone Camp	6/6-8/2023	Dayton, OH	8	N/A
Sinclair	Air Camp: Elementary School Camp	6/9/2023	Dayton, OH	47	N/A
Sinclair	Air Camp: Middle School Camp	6/14/2023	Dayton, OH	46	N/A
Sinclair	Air Camp: High School Camp	6/22/2023	Dayton, OH	48	N/A
Sinclair	Air Camp: Middle School Camp	6/28/2023	Dayton, OH	46	N/A
Sinclair	Air Camp: High School Camp	7/10/2023	Dayton, OH	40	N/A
Sinclair	Air Camp: Teacher Camp	7/10/2023	Dayton, OH	0	50

Sinclair	Wright Brothers Institute UAS Camp	7/12/2023	Dayton, OH	27	N/A
Sinclair	Air Camp: Teacher Camp	7/18/2023	Dayton, OH	0	47
Sinclair	Air Camp: Elementary School Camp	7/24-25/2023	Dayton, OH	51	N/A
Sinclair	WACO Aviation Learning Center Drone Camps: grades 5-6	8/1-3/2023	Troy, OH	15	N/A
Sinclair	WACO Aviation Learning Center Drone Camps: grades 7-9	8/1-3/2023	Troy, OH	10	N/A

6 APPENDIX B

Summary of Phases I-III of ASSURE STEM Projects and Reference Information. This Table is provided using data from the A39 STEM III Final Report.

Table 3. Previous STEM Project Summary.

Phase	Performing School	Description of Events	Total Number of Participants
STEM I	Tuskegee University	4 Roadshows and 1 Summer Camp	225
STEM I	New Mexico State University	3 Roadshows and 2 Summer Camps	1,010
STEM I Totals		10 Events	1,235
STEM II	University of Alaska Fairbanks	3 Roadshows and 4 additional outreach events	Approx. 700
STEM II	University of California Davis	1 Summer Camp and 3 additional outreach events	Approx. 2,000 15 – Summer Camp
STEM II	Montana State University	2 outreach events and 2 additional apprenticeships supported	102
STEM II	New Mexico State University	4 Summer camps, 1 outreach activity, and 5 speaking engagements	520
STEM II Totals		24 Events	3,337
STEM III	University of Alabama Huntsville	18 total outreach events	765
STEM III	University of Alaska Fairbanks	29 total outreach events	1,805
STEM III	University of California Davis	3 total outreach events	39
STEM III	Ohio State University	4 total outreach events + additional online programs	127
STEM III	Sinclair College	118 total outreach events	9,198
STEM III	New Mexico State University	7 total outreach events	580
STEM III Totals		179 Events	12,514
Cumulative ASSURE STEM Outreach		213 Events	17,086