Utah STEM Action Center Annual Report FY2024

Annual Report to the Education Interim Committee November 15, 2024

The following report is being submitted to the Education Interim Committee by the STEM Action Center. The report contains the following requested information:

1. **The Board shall report the progress of the STEM Action Center, including the information described in Subsection (2), to the following groups once each year:**

2. **The report described in Subsection (1) shall include information that demonstrates the effectiveness of the program, including:**
    - **a. the number of educators receiving high-quality professional development;**
    - **b. the number of students receiving services from the STEM Action Center;**
    - **c. a list of the providers selected pursuant to this part;**
    - **d. a report on the STEM Action Centers fulfillment of its duties described in Subsection 63M-1-3204; and**
    - **e. student performance of students participating in a STEM Action Center program as collected in Subsection 63M-1-3204(4).**

The number of educators receiving high quality professional development

The STEM Action Center (STEM AC) supports high quality professional development that aligns resources to locally identified STEM-related educator needs. Supported activities can include coaching, mentoring, self-reflection, off-contract work, and effective professional learning communities (PLCs). The STEM AC also provides professional learning to support educators that are participating in other programs such as the Computing Partnership, Math, STEM in Motion and the annual STEM Best Practices conference.

K-12 PROFESSIONAL LEARNING

The Professional Learning (PL) program supported 34 grants in the 2023-24 school year, directly impacting 2,940 educators. The program design varies greatly within this grant program and includes solutions to locally identified issues that support their long-term strategic plan with compensation for off contract work, lesson study in a Professional Learning Community, and in-depth learning and implementation of math and science practices. Additionally, 43 educators participated in the new STEM Education Innovators (SEI) program.

K-12 MATH PERSONALIZED LEARNING

Educators and administrators from 741 schools received professional learning for the use of the K-12 Math Personalized Learning tools as part of the contracts with the product providers. This training ensured that educators were able to integrate the use of the software effectively as a supplement to their instruction. As part of the AmeriCorps Math Mentors program, the STEM AC provided extensive training to 39 math mentors, enabling them to provide engaging support to struggling students.

STEM IN MOTION

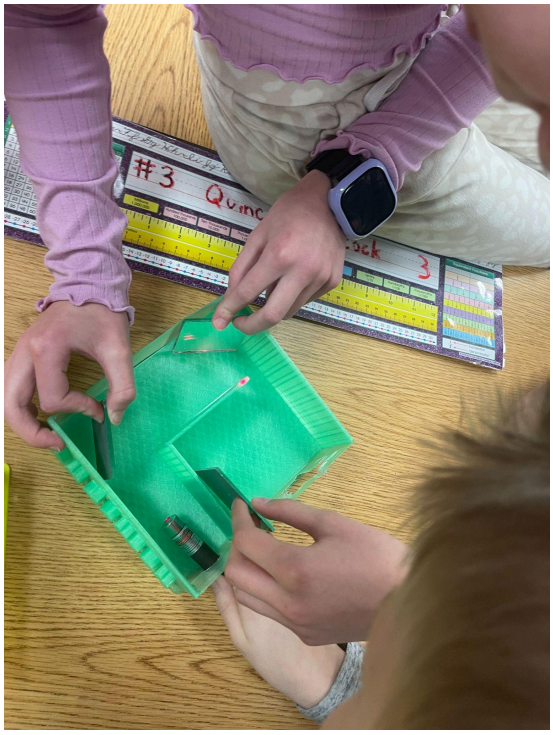
The STEM in Motion Curriculum kit program allows teachers and educators to check out various STEM-related curriculum kits for their classrooms for a two-week period. Teachers are able to train themselves on the material using online videos and lesson plans. There were 140 schools and community education programs that participated in the past year through the STEM in Motion program and were trained in STEM lesson teaching. Sixty eight of the educational programs were located off the Wasatch front, and 72 were on the Wasatch front.

STEM BEST PRACTICES CONFERENCE

In June of 2024, the STEM AC team hosted two STEM Best Practices conferences for Utah educators. One conference site was held in Layton with 337 attendees and the second was in Bryce Canyon with 77 attendees. The theme was “Invention, Innovation, and Making.” Captain Barrington Irving was the keynote speaker who discussed how STEM and making inspired him as a high school student and changed his life, which led to him becoming the youngest person to fly solo around the world in a plane he built himself. Teachers selected sessions by grade level, all of which aligned to Utah education standards and included hands-on activities for teachers to experience through the practice of being the student. At the end, a giveaway session was hosted with prizes from local companies that generously donated to Utah educators, with over 57 prizes to give away between the two conferences. Favorite items included Get Away Today vouchers, Hale Centre Theatre tickets, Sundance Resort ski passes, and more.

The number of students receiving services from the STEM AC and the number of students that accessed resources from the STEM AC

- *Classroom Innovation Program:* 14,548 students engaged in innovative STEM classroom activities



4th grade students 3D printed structures then added mirrors to learn about reflection and refraction.

1st grade students built greenhouses in small groups to learn about the needs of living things and plant life cycles.

High school students in an Environment Science course complete a lab about water quality.

- *STEM Competition Grants:* 1,663 students were impacted through participation in STEM-related competitions
- *K-12 Math Personalized Learning Program:* 142,102 students had access to supplemental math software
- *STEM Fest:* 14,000 students, educators, and parents engaged in hands-on STEM experiences from 53 exhibitors
- *Community Impact Sponsorships:* 35 STEM community events and programs provided access to 36,958 students, parents, educators, administrators, community and industry partners
- *STEM in Motion (SIM):* 12,000 students were impacted through participation in the SIM programs across 140 local education agencies.
- *Girls Who Code Club Network:* 96 girls and 16 facilitators participated in 13 clubs
- *K-16 Computing Partnerships:* 26,692 students participated in activities that integrated coding and computational thinking across multiple disciplines and in STEM-immersive learning environments (note that students may have participated in multiple activities)
- *Tinker Totes:* 825 students were impacted by access to the Tinker Totes (note that more than one student can participate in the activities in the Totes)
- *STEM AC Innovation Hub:* 2,524 participants pre-K to adult participated in Innovation Hub programs (this includes participation in robotics programs, Innovation Hub classes, and Open Tinker Time)
- *STEM on Stage:* 36,618 elementary students were impacted by the unique STEM assembly show at 67 schools.

- *Hydroponics*: 4300 students and 390 teachers impacted at 9 schools

- *MILO and Friends:* 7000 early math games & parent-facing guides were passed out at more than 50 events

A list of provides pursuant to this bill:

- Age of Learning (My Math Academy)
- Curriculum Associates (i-Ready)
- Derivita
- Dream Box Learning
- Imagine Learning (Imagine Math)
- IXL
- Mathspace
- McGraw Hill (ALEKS)
- MIND Research Institute (ST Math)
- Renaissance Learning (Star Math)

A report of the STEM AC fulfillment of its duties described in subsection 63M 1-3204

(a) STEM Action Center (STEM AC) Staff and Roles - 63M-1-3204; 1(a), (c) (i)

The STEM Action Center (STEM AC) consists of the Executive Advisory Board, a Division Director (Dr. Tami Goetz), Deputy Director (Sue Redington), Collaboration and Program Development Manager (Kellie Yates), Research and Implementation Manager (Clarence Ames), Community and Innovation Manager (Lynn Reichert), Program Specialist (Gina Muhlestein), Program Outreach Manager (Julienne Bailey), Innovation Hub Manager (Becca Robison), Office Manager (Viena Zeitler) and Marketing and Communications Manager (Shelby Averett). There are two project manager positions supported by an AmeriCorps grant (AmeriCorps Math Mentor Program or AMMP); Jana Alexander and Emmett Speed.

There is a part-time director for the Utah STEM Foundation (Allison Spencer), along with a Utah STEM Foundation Board. The STEM AC works collaboratively with several other state agencies (e.g., Utah Department of Workforce Services, other divisions within the Utah Department of Cultural & Community Engagement, the Office of Energy Development, Talent Ready Utah, the Utah System of Higher Education, the Utah State Board of Education, the Governor's Office of Economic Opportunity, the Utah Geological Survey etc.) to support STEM education and workforce and economic development.

During FY24, several interns worked with the STEM AC staff: Isha Madley and Verene Huong (from the Academy for Math, Engineering and Science), and Val Rodriguez, Anhkhoa Le, and Jacklyn Wei (2024 Student Leaders sponsored by Bank of America). The STEM AC participated in the Utah-Jordan Leadership Exchange Program and mentored a young Jordanian professional, Sara alKhatib, for one month. The Center has a continued part-time employment agreement with Emma Casey, a freshman at the University of Utah.

The STEM AC reports to the STEM Action Center Executive Advisory Board, with its membership and duties defined by statute. This model has worked well, with the Board providing tremendous financial and in-kind support, as well as oversight of the STEM AC's strategy, process, and accountability. The ability of the Board to have a strong role in the direction of the STEM AC, providing guidance to the Director, has led to considerable buy-in from industry and the Utah State Board of Education office. The Board has representation from industry, the Utah State Board of Education, the Utah System of Higher Education, and the Utah Department of Workforce Services. The STEM AC Executive Advisory Board and the Utah STEM Foundation Board meet together at least once a year to facilitate collaboration between the two boards. Further, members of each board

attend the other boards meetings on a regular basis to ensure that the activities of each board support STEM education as it aligns to the STEM AC's strategic plan and statutory expectations.

(b) Private entity engagement - 63M-1- 3204; 1(d); 2 (e)

UTAH STEM FOUNDATION
Industry partners, and their support, are crucial to the mission of the STEM AC. Industry partners ensure that programs and efforts connect companies into the classroom, increase STEM workforce opportunities in Utah, and enhance STEM funding and resource opportunities. The Utah STEM Foundation, with its vision and mission aligned to the STEM AC, helps to create the bridge from education to the private sector. The Foundation's support from industry has been provided in a variety of ways including cash donations, grants and sponsorships, program collaborations and in-kind support through volunteer efforts.

The Utah STEM Foundation was added to the STEM AC's statute, thus allowing for the creation of a public foundation. The STEM AC worked with State Finance to ensure proper procedure and process for its role, function and operations. It became official on May 10, 2017, having received the Letter of Determination from the Internal Revenue Service. The Foundation has an advisory board with industry support from Marathon Petroleum, (formerly Tesoro), Texas Instruments, MHTN Architects, Rio Tinto, Brassica Protection Products, and US Synthetic. A part-time director (Allison Spencer) oversees the functions and activities of the Foundation Board, as well as the receipt of all donations from corporate partners. The Foundation Board continues to develop and expand on many new and existing community partners and donors, who are in turn increasing their donations each year.

Programs that are supported by the Foundation include:

The Utah STEM Foundation helps to support STEM Fest, STEM in Motion, STEM On Stage Magic Show with Paul Brewer, STEM Best Practices, Green Our Planet Hydroponics programs, STEM Spots, STEM Innovation Hub, FIRST and VEX Robotics, Micro STEM Fest kits, mySTEM, Tinker Totes, as well as many other STEM initiatives that have statewide impact.

Cash Donations for FY 24 include:
The Utah STEM Foundation received over $666,080.59 in monetary donations in fiscal year 2024 (FY24), and almost $10,000 of in-kind donations.

Utah STEM Foundation and Donor Highlights

Bank Of America:, Bank of America has funded $24,000 in FY24, as part of their Student Leaders Program, for the STEM AC to hire three interns to assist with the Center's STEM Programs.

bioMerieux: The STEM AC received a $200,000 grant from bioMerieux to support Micro STEM Fests, launch the Inventioneers of Today and Tomorrow, and pilot Pop Up Maker Faires.

Club Ability:
The Utah STEM AC has partnered with Juliette Bautista for the Club Ability program that offers coding courses to minority women, children, those with disabilities and parents requiring basic computer skills. As of FY24, The STEM AC has helped raise over $130,000 to support her program.

Hydroponics: As an expansion of the Hydroponics program, and in partnership with Green Our Planet (GOP), a pilot of an innovative high school - community hydrofarm program will begin with the delivery of multiple units to the Navajo Nation (Monument Valley and Navajo Mountain) and the Mountain Ute Nation (White Mesa) in August of 2024. There are discussions underway to launch a program with the Paiute Indian Tribe of Utah in Cedar City, UT. Donors for this effort in FY24

include: Texas Instruments, Marathon Oil, Common Spirits Health, Northrop Grumman, Meta, as well as private donors. Green Our Planet will provide a match of $100,000.

Tinker Totes: The totes were created to serve students from 9-15-years-old and are designed to facilitate open inquiry for engineering and maker learning. They are used for classroom and out of classroom (e.g., after school, at home, etc.). The bags are fully funded by donations and assembled by volunteers.

US Synthetic, in addition to being our top sponsor for STEM Fest annually, they helped to spearhead the Tinker Tote program to incorporate employee and community engagement.

Texas Instruments and Navajo Strong teamed with the STEM AC to donate and help deliver STEM Tinker Totes and other STEM resources to students in the Navajo Nation, reaching over six schools and community centers, as well as taking supplies to veterans living in Navajo Nation.

- Number of Tinker Totes assembled: 825
- The cost to create 825 Tinker Totes: $24,750
- Donated funds to the Tinker Tote Program: $28,000
- The Tinker Totes that were assembled went to: American Indian Services, Utah Foster Care, Mary W. Jackson Elementary, SLCC and Verizon's Innovation Learning Summer Camp, Common Thread, and an internal focus group to improve the Tinker Totes for future runs.

Companies who have donated to The Tinker Totes program in FY24 include:

- US Synthetic
- Comcast
- Fidelity
- PROG Foundation
- Texas Instruments

Utah STEM Industry Coalition (USIC)

The Utah STEM Foundation oversees the Utah STEM Industry Coalition (USIC), which consists of over 90 companies from across the state. The Coalition meets quarterly and focuses on key STEM-related activities that require industry support, both financially and in kind. The participating companies have been critical in helping with efforts such as STEM Fest, Week of STEM and volunteer support for numerous opportunities that include coaching of competitive robotics teams, and helping to build STEM Spots. They help to identify the dynamic needs of Utah companies to ensure that programs remain aligned to support their growth and success.

COMMUNITY IMPACT

Sponsored Events

The STEM AC uses a portion of its operational budget, leveraged with industry support, to sponsor various events. Sponsored events help to provide exposure to STEM education and career opportunities for students
and communities.

The following list includes examples of programs and events that received STEM Action Center sponsorship funding in FY24, as well as those hosted by the STEM Action Center.

Community Impact Sponsorships FY24.xlsx

Week of STEM

In FY24, the STEM AC celebrated the second annual Week of STEM, November 6-10, 2024. The theme was "Innovation, Invention, and Making" to illustrate how STEM is integral to creating and inventing. The goal during this week of STEM was to show how we are all makers, and to highlight makerspace opportunities statewide.

The Week of STEM was launched by an event to showcase the winners of a design competition in partnership with Checkerspot. Undergraduate students from Utah universities were challenged to design STEM learning manipulatives for students who are blind or sight-impaired. The students created 3D prototypes and then casted the final object using Checkerspot's innovative algae-based plastic.

During the Week of STEM, Utah Makers provided insight into their STEM and making in a video series on that was shared on the STEM AC social media pages. The video features included Jessica Taylor Nichols who helped design a stroke recovery device, Fred Conlon a local welder who creates artistic sculptures and other projects, Robb "Little Owl" Martin, a flute maker, Spencer Loveless and Wesley Murry who are innovating in 3D printing, and Radhiha Shankar who uses recycled materials to make art.

The Week of STEM also included spotlighting historic Utah inventors in an Inventors Coloring Book written by Tami Goetz and illustrated by local artist Nathan Hawks. Tinker Totes were distributed to engage children and youth in making.

Utah STEM Fest

The STEM Action Center, together with Utah's STEM companies, showcased exciting career paths and hands-on STEM activities at the ninth annual STEM Fest. There were 11,028 field trip attendees from 103 schools. More than 53 exhibitors provided interactive activities and demonstrations. An additional 3,000 visitors attended the free Family Night at STEM Fest. Exhibits included a mobile planetarium, a bug show from Thanksgiving Point, KSL-TV's green screen station, FIRST and VEX robotics, Rocky Mountain Power's demonstration booth, Utah Valley University's exciting science demonstrations, and much more.

For the free Family Night, entertainer Paul Brewer impressed the crowd with his STEM On Stage magic show. Prizes were given away to attendees including two donated plane tickets from JetBlue.

STEM Fest is a great opportunity for students and educators, but also for STEM industry professionals who get the chance to engage with the public and future leaders in STEM. They showcase what their company does and bring awareness to job opportunities. Students from all over Utah attended, with some classes traveling from Daggett, Duchesne, Emery, Miller, and San Juan counties. The event relies on volunteer support and for FY24 there were 158 volunteers from industry and the community.

STEM IN MOTION (SIM)

The STEM in Motion (SIM) Program brings exciting STEM activities and resources to schools and communities all across Utah. The outcomes from a SIM experience include increased student engagement and enthusiasm for STEM activities, increased teacher awareness of STEM education, and increased industry investment in STEM.

The SIM team currently uses STEM curriculum materials that provide experiential, real-world, project-based learning opportunities for students. The program also ties classroom-learning experiences to STEM AC classroom grants to help educators get the resources they need to continue the lessons after the SIM experience, as well as serving as a connection point for teachers to learn of other timely STEM resources. The connection to STEM careers is what makes the SIM program unique from many other informal STEM programs in Utah.

The SIM team has been actively engaged in partnering with local companies to enhance the curricula selection every year. Programs are now added regularly based on teacher feedback,

industry needs, and core standards requirements.

Currently, the SIM team has redesigned the classroom program into a curriculum kit checkout program due to COVID. Teachers can choose from 15 different curricula to check out for a two-week period, which includes all the materials necessary, and a Google drive with video lesson plans, PDF lesson plans and follow up activities. The new STEM curriculum materials are thoroughly tested before each school year. Various groups of educators and students are scheduled to come to the STEM AC Innovation Hub and test the kits out, providing the SIM team with observation opportunities, as well as direct instructor and student feedback.

The SIM team added copies of popular kits in order to meet increasing demand. The 23-24 school year curriculum includes:

- Additive Manufacturing - 1 kit available (6-12)
- BeeBots - 2 kits available (K-3)
- Colorado River - 2 kits available (3-5)
- Discovering Genetics - 1 kit available (6-8)
- Great Salt Lake - 1 kit available (4-6)
- Hands-On Coding - 1 kit available (3-6)
- Mission to Mars - 2 kits available (4-8)
- Physics & Forces - 2 kits available (K-3)
- Probability & Game Design - 1 kit available (6-)
- Power Tiles - 1 kit available (1-4)
- Renewable Energy - 2 kits available (5-7)
- Senses & the Brain - 2 kits available (4-6)
- Sphero Robotics - 1 kit available (2-8)
- Utah Lake - 1 kit available (5-7)
- Utah's Geology - 1 kit available (3-7)

	17-18	18-19	19-20	20-21	21-22	22-23	23-24
Schools Served	53	64	47	70	71	134	140
Students Reached	8,437	10,780	6,171	> 8,000	>4,831*	~11,000	~12,000
School Districts Visited	19	20	17	26	26	33	38

*Implementation of new survey methods impacted reported numbers.

Based on teacher feedback, the SIM program has shifted to a kit-based model, with a focus on gathering data on what elements teachers used most frequently and found most valuable.

During the 2023-2024 school year, the SIM team continued to support classrooms through a kit style program. 79.5% of teachers found the included presentations and lesson plans valuable, with 71.8% of teachers implementing the pre-recorded video lessons. Other offerings, such as career connection videos, follow-up activities, and other STEM Action Center resources were used by between 30% and 40% of teachers - a roughly 10% increase from previous years.

Based on teacher feedback surveys after a SIM visit, 95.1% of educators indicated that they felt prepared or very prepared to teach STEM in their classrooms after using a SIM kit, compared to 53.6% before using a SIM kit. After using a SIM kit, 95.1% of teachers indicated that their students were "interested" or "very interested" in STEM, compared to 58.5% before using the kit. More than 90% of teachers would recommend the STEM in Motion program to other teachers.

Surveys administered to students before and after participation in a SIM experience intended to measure student STEM identity (whether students see themselves as "STEM" person) reported that students had an overall 9.2% increase in STEM identity, measured by a students' interest, perceived ability, and perceived future prospects.

Additional teacher testimonials about the STEM in Motion Program:

"The BeeBots were so much fun! I love receiving these kinds of products that we as a school can't afford to buy ourselves. So the kids at least get a chance to try them all."

"Thank you SO much for this wonderful opportunity!! The students loved interacting with this kit and learned a lot about circuits! I really like the 2-week check out format. This gave all teachers the opportunity to use the kit that would like to. Out of all our K-3 teachers, only 1 opted not to participate, and we had a 4th grade teacher request the use of the kit even though I only offered it to the lower grades! All teachers were very excited and loved this lesson!! Thanks again for this amazing opportunity!!"

"I have a unique classroom setting and love these kits! Students of all grades learn something from the materials and enjoy the hands-on activities."

(c) R&D role of STEM AC - 63M-1- 3204; 2 (a)- (c); (f)

THE VALUE OF THIRD-PARTY EVALUATION

The STEM AC continues to integrate rigorous third-party evaluation to increase accountability and research integrity for the following programs: K-12 Math programs, Professional Learning, and K-16 Computing Partnerships. The STEM AC has a contract with the Utah Education Policy Center (UEPC) at the University of Utah, which supports credible third-party evaluation that sustains a high level of fidelity and objectivity. The parameters of the evaluation (such as metrics and data that are to be collected) are defined by the requirements of the STEM AC's statute, and recommendations by the third-party evaluator, the Utah State Board of Education (USBE), and Local Education Agency (LEA) partners.

Comprehensive logic models are created for all programs, and the outputs and outcomes defined in the logic models drive the data collection and evaluation process. The STEM AC team reviews the third-party evaluation scope annually to ensure that the data fulfills the metrics identified in the logic models for each program. The STEM AC team also looks for opportunities to shift a portion of the evaluation work to the Center staff that will not compromise the integrity of the evaluation, but allows for efficient use of funds.

THE INTEGRATION OF R&D INTO STEM AC PROGRAMS

The STEM AC has been evaluating various math software programs to understand the relationship between product use and student achievement. Through this process, we have clearly identified that while the majority of ed tech products are ineffective, a few of them are can be really powerful tools that allow teachers to facilitate better learning experiences for students. In the 2022-23 school year, we began to examine how teacher variables related to software use impact outcomes for students using software. The first full report on teacher practices was conducted over the 2023-24 school year (see Appendix XX). Existing research shows that human connection impacts student achievement in mathematics more than any other kind of intervention. To understand how the impacts of two effective interventions might compound, the STEM AC created the AmeriCorps Math Mentors program. Research on the relationship between providing mentoring to students while students are using software is currently underway.

The STEM AC actively seeks out grant opportunities that support research that can inform

innovative program development and assessment. Past examples include the National Science Foundation (NSF) grant, *Linking Attitudes and Behaviors for Student Success*, which collected data that helps to inform more effective communication strategies to increase awareness of Career and Technical Education pathways.

Current research efforts include:

- A pilot grant in partnership with the University of Utah, Utah State University and Utah Valley University that focuses on measuring how children, youth and adults acquire a STEM, and specifically an engineering, identity through maker learning. This aligns well to the efforts in maker learning that are being supported in the STEM ACs Innovation Hub and Utah Innovation Hub Network.
- A pilot grant in partnership with the University of Utah pediatric medicine department, "*Nurturing Numeracy*". The math that caregivers do with their children at home between age 0-5 predicts future academic and career success better than any other commonly researched variable. As part of the *Nurturing Numeracy* program pediatricians provide resources to the families coming into their 3 year old well-check visits, and teach caregivers how to nurture childrens' budding mathematics skills.

The STEM AC recently submitted two grants to the US Department of Education to support research on math and science technology-based resources. The grants were a partnership with WestEd, Utah Education Policy Center and two educational technology providers. These grants are pending funding, with anticipated notification by the end of the 2024 calendar year.

(d) Review and acquire STEM education- related technology - 63M-1-3204 2 (c)

There are several programs at the STEM AC that review new education-based technologies to supplement instruction in classrooms, as well as informal and community-based efforts. The criteria for review focus on whether it addresses a need, is in alignment to the Center's strategic plan and statutory language, the quality of the resource, user friendliness for implementation in a variety of environments, and cost effectiveness that will impact scalability and sustainability.

The STEM AC Innovation Hub, which opened in June of 2021, plays a large role in testing new technologies and resources that can support STEM education through maker learning. For example, a program from the University of California-Davis C-STEM program, integrates the use of robotics to teach elementary and early secondary math. The Hub tested the effectiveness of the resources and they are now being used with great success in STEM programs across the state including at Utah Valley University and the Jordan School District. It is anticipated that the program will be scaled to several other partner sites in the spring of 2025.

One goal of the STEM in Motion (SIM) program is to identify and utilize new and innovative approaches in technology. The STEM AC has partnered with Utah Geology Survey to provide curriculum material development that are being used to identify rocks and minerals. Additionally, the Center has added Discovering Genetics curriculum materials that use 3D printed educational manipulatives in order to help students explore complex genetics topics.

(e) Use resources to bring the latest STEM education learning tools into the classroom - 63M-1-3204 2 (f)

The STEM AC works closely with partners in the STEM community to identify needs in STEM education, both for classrooms and for informal STEM opportunities. The intent is to connect new STEM education learning tools and resources to the identified needs in order to support and improve STEM instruction. This is described in the previous section as it relates to several of the STEM AC programs. The STEM AC has worked with partners in other states, such as Washington, to adapt an early math program that supports parents in math instruction with their young children. MILO (Math Introductions and Learning Opportunities; see below) and Friends

has been piloted during FY23 with great success and is being scaled over FY24.

The annual STEM Best Practices conference has been in place since 2015 and has the main goal of bringing together Utah STEM (and non-STEM) educators to showcase hands-on learning activities and potential effective practices in the classroom. This provides an opportunity to share ideas and promote the use of the latest in STEM resources.

STEM Action Center programs "fuel the innovation engine" of the Center.

(1) The Utah STEM in Motion (SIM) team members are constantly developing and testing new resources. For example, for upcoming school years, the STEM in Motion curriculum is being updated to better align with the science and engineering practices in the Utah SEEd standards, as well as integrating cross-cutting concepts in more robust ways.

(2) The STEM Action Center's Innovation Hub found a creative solution to staffing maker learning spaces with individuals that have a passion for STEM learning. The Innovation Hub's operations are fully covered by Innovation Hub AmeriCorps members, whose living stipends are covered by the Utah Innovation Hub AmeriCorps grant. Those AmeriCorps members are supported by two full time, legislatively funded STEM Action Center staff members that directly supervise AmeriCorps members and ensure all Innovation Hub programming is within scope and aligned to the STEM Action Center's mission and vision. Using AmeriCorps members on the front line of the Innovation Hub allows the Center to achieve a scale of programming that increases access for children, youth and the community.

AmeriCorps members represent a wide variety of personal and professional skill sets and interests. The STEM AC team empowers these members to develop classes, workshops and opportunities that align to their specific skills and interests. This has allowed the Center to offer programming that both aligns to STEM and appeals to participants that may not otherwise register for STEM-specific programming, with a goal of improving STEM identity for all participants. Some of those programs developed this year include: (1) STEM Dungeon Master Bootcamp, leveraging the surge in popularity that's been seen with Dungeons and Dragons over the past few years, (2)Interactive Fiction Workshops, which teaches participants how to create text-based video games, appealing to students that are uniquely interested in ELA and creative writing and (3) Woodblock Print and Play, which focuses on the historical invention of the printing press and guides participants through creating unique card decks using this historical technology, which appealed greatly to participants interested in history.

Leveraging our AmeriCorps members to create unique programming with different ranges of appeal is allowing the Center to innovatively fulfill our mission of bringing STEM to every Utah home, school, and community.

(3) The STEM AC provides small grants, through the Innovation Incubators micro grant program to classroom educators to support the design and implementation of new STEM activities. This grant program is discussed in detail in the following section.

(f) Support of STEM-related competitions, fairs, and camps, and STEM education activities - 63M-1-3204; 2 (d)

The STEM AC funds and oversees the Innovation Incubator program. This program includes three micro-grant opportunities: (1) Student Competition (2) Classroom and (3) Community Impact (see previous section).

COMPETITION

Studies show that students who participate in STEM competitions are much more likely to pursue STEM careers (Miller, et al, 2018). The STEM Competitions program is intended to support K-12 students' participation in STEM competitions. Applications for the program must be completed by a school-level representative on behalf of the students benefiting from the grant in order to be accepted. The school-level representative oversees the funding and is responsible for reporting outcomes. Competition grants cover costs for supplies, registration, and other expenses related to participation in STEM fairs and competitions. Schools may request up to $100 per participating student, with a maximum of $5000 per school, and receive funding based on the strength of their application. A review team made up of other grant applicants, focusing on sustainable student impact, helped to generate scores. Before the end of the school year, each awarded school must submit detailed receipts and project completion reports showcasing what students accomplished. Educators report on the effectiveness of the process, what they were able to accomplish, and how projects impacted students.

The Competition Program supported a variety of projects this year. Many educators used the funds they were awarded to provide materials, competition fees, and learning opportunities for robotics teams. Others facilitated student-led research projects, while some emphasized specific STEM areas like electrical engineering or 3D science learning. Projects enhanced student learning through hands-on experience, skill development, teamwork, problem-solving, and exposure to real-world STEM applications.

"Having funds for registering our eight Vex IQ robotic teams and receiving funding to cover the cost of competitions helped our school's Vex IQ Robotics program to continue. Without this funding, our school would be unable to have a Vex IQ Robotics program. The Vex IQ Robotics program has helped students enhance their creativity, problem solving skills, teamwork, critical thinking, and resilience."

"The Utah STEM Action Center Grant helped me as an educator to stretch myself to learn about the Vex Robotics IQ program and to learn with my teams. Without the Utah STEM Action Center Grant, our school would have been unable to have a Vex IQ Robotics competitive program. Thank you for the support!"

"This project adds to the available tools for all students at the school. The process of thinking through how to create code is an applicable skill in all areas of life, but particularly in STEM fields, where systematic approaches to problem-solving have proven to be the most effective. After the competition season was over, more students had access to the robots to learn these principles, and I began to see throughout the season how mini lessons in coding could be helpful for all students."

"VEXIQ is all about students learning STEM! They engineer and build a robot, code and program a robot to do something and then compete with this robot, both working with another team as well as individually. Every problem solving skill within STEM is used. Along with STEM learning they also learn to problem solve with people and people skills as well. This is a great program for students to learn STEM!"

"We were able to expand the number of students who attend the fair because we were able to shift financial resources from the engineering project to feeding them lunch, transportation to the fair, and help with supplies for some of their projects. It will also help us take more students to the State level science fair in March as we will use some of the grant money to cover entry fees and transportations for them."

"This gives the students an opportunity to practice real science and engineering practices, by applying them to the topics of their choice. It allows them to choose what to investigate and how to investigate it. In addition, they get the chance to speak with local science and engineering leaders and have the chance to solve a problem with our engineering project that we have them

do. To continue bringing this level of organization and competition to the rural students of the Uintah Basin, we would not have been able to accomplish this much for them without the additional funding that the grant gave to us. "

"Students got to practice actual real science in my classroom. They were asking questions about hologram technology. Especially on how to determine if a particle was suitable to display by collecting data on its effectiveness in lighting up. By analyzing their data students were able to modify their investigations and construct explanation as to why they were successful or not successful in the competition. If they got stuck they were able to ask me, research online or reach out to an actual scientist from BYU for more information."

For the 2023-24 school year the STEM Action Center awarded funding to 45 schools but one school did drop out, bringing the total schools funded to 44, for a total of $69,914. In their project completion reports, grantees also reported that participation in these opportunities positively impacted students' confidence in STEM subjects, helped develop important interpersonal skills, and even resulted in students choosing to go to college and choose STEM majors. In spite of challenges, all grantees were able to provide engaging activities resulting in increased STEM interest and engagement among their students. Additional report details, including a list of participating schools and number of students impacted can be found at Competition Grant Report FY24.

CLASSROOM

The Classroom Program directly supports educators to pilot innovative approaches to STEM education, recognizing that innovative curricular resources developed by local educators need to be replicated and spread as widely as possible throughout the state. For FY24, a total of 127 completed grant applications were received. Of those applications, 84 proposals (66%) received a portion of the funds requested. Applications are scored by previous classroom grant awardees, using a rubric to determine which proposals would be funded. The amount of funding for classroom grants in FY24 totals just over $100,924.00, with an impact on 14,548 Utah students. In FY24, 37 of 84 (44%) of classroom grants were awarded to educators off the Wasatch Front. A summary of the LEAs, grades, and number of students can be found here: FY24 Classroom Grants for reports

Lesson plans are requested from awardees in order to facilitate increased access to and involvement with innovative STEM curricula throughout Utah. These resources have been made available to Utah educators via the STEM Action Center's website. Grant awardees were also asked to present their project in a session as part of the STEM Best Practices conference, which was held at two locations in June of 2024. Participants receiving support are expected to complete a final report that describes outputs and outcomes. These reports are critical to educators that choose to utilize the shared materials as it provides follow up information and suggestions to other educators. Responses for the final report vary greatly, but include:

"*3D printers have greatly affected the amount of problem solving that students are doing in my classroom. They aren't afraid to make mistakes and they enjoy coming up with solutions to help their classmates. Students are engaged in hands-on application of creating models for science, they use the software Tinkercad almost daily to create and design things that will be useful to them. They are learning important engineering principals as some of our designs fail and they have to analyze the reason why. They have a deeper understanding of how measurement is important and how fractions and decimals are connected. They can compare fractions with real world knowledge."*

"This was my first time applying for and receiving a grant! I found the entire process to be educational, informative, challenging, and rewarding.This grant has expanded my view of what is possible in the classroom and motivates me to look beyond my current practices to see what project-based learning opportunities I can create for my students. I feel more confident now to

design creative opportunities for my students and to seek out funding from places like the Utah Stem Action Center in order to make those learning opportunities a reality for my students."

"This grant helped me to understand that just memorizing the facts and algorithms are not serving a lot of students in the way that we have previously thought. It helped me to change the way I think about math and how it will serve students to think of mathematical processes and reasoning in a different way. I love that the program makes students have productive struggles and to share their thought processes together."

"This grant helped me as an educator to provide enjoyable hands-on learning opportunities for our students. Students had fun while learning and problems were solved in their own unique ways."

I learned more about vibrations and that the ripples of a stone don't just extend out on top of the water, but actually go down deep into water. I learned that integrated subjects are exciting to the students. The students in other classes told students from other teachers about the project and they are looking forward to coming to class with anticipation."

"I love how this project integrated with the 4th grade core on fossils, and also with ELA in the writing of our field journals, and STEM, etc... This grant was so awesome for me as an educator. It gave me an opportunity to do a grand scale unit study of fossils. Most of the materials purchased with this grant will be reused and be able to serve our school forever. I learned to take copious notes of each class period to help me with the next class and the next year I do this project. It was so great!"

"As an educator, this gave me the opportunity to facilitate Project Based Learning in my classroom and see how it truly could work and enhance education. I was able to see firsthand how much more students were engaged and actively learning when they had choices in their projects. It also helped me to open conversations with other educators about increasing the cross-curricular approach at our school. This project helped student stem learning by incorporating so many aspects into each project. I had students begging to come to school before school and after school to work on it. I heard lots of conversations in the hall about engineering, math, and history, and how they all related. I even had students competing to see which could connect their project to the most other classes. This opened the eyes of many students to the interconnectedness of all disciplines of learning."

"Having students create their drawing robots is a fantastic way to boost their STEM learning.This project is a perfect blend of art and technology, showing students that STEM isn't just about equations and coding. It's also about creativity and bringing imaginative ideas to life.Building a robot in teams fosters collaboration. Students learn to communicate ideas and work together to overcome challenges, mirroring real-world STEM projects. It also boosts students' confidence in their STEM abilities. It shows them that they can tackle complex projects and succeed."

This project is to help find areas of different shapes using a drone and coding skills. My school is in a rural area and many of our students live on farm land. Calculating the area of different properties in the area helps use real world problems. This project will be done with our entire 105 student body of 6th grade students. This project will help them in the future with being able to find sizes of property and estimate how much water or fertilizer that will need to be used on their farms. The drone will be able to be coded and will help teach the students utilizing pseudocode and/or other descriptive methods…We are going to discuss what else you would need to code to plan things for your farm, such as a watering schedule or feeding schedule. This project will tie into our math standards as well as our new computer science standards. Within our computer science standards they have given us a program for students to be able to code things on the computer but this project will help students visualize and be able to work code in a real life situation."

(g) Identification of best practices being used outside the state and learning tools for K-12 classrooms - 63M-1-3204 2 (h and i)

The STEM AC Director, Dr. Goetz, participates in the annual Midwest STEM Directors Symposium and attends other STEM events (e.g., the annual Washington STEM conference, the Association of Career and Technical Education, the national STEM Ecosystems, the STEM Innovation Forum, etc.) to continue the search for best practices in STEM education. Goetz participates in STEMx and the Wild West STEM Ecosystem on a monthly basis to engage with other STEM practitioners. Several successful programs at the STEM AC were discovered through conference attendance and connections with other state-level STEM initiatives.

(h) Provide a Utah best practices data- base - 63M-1-3204, 2 (j)

The STEM Action Center website provides access to best practices and content that targets students, parents, educators, and industry partners. The new website, which was launched in 2021, has been very successful and the analytics from website usage will be discussed in later sections of this report.

The STEM AC initiated a new project that supports online access to high quality STEM resources. The STEM Resource Library includes lessons for teachers, links to online resources, career videos, and more. It also features a map showing where STEM AC programs are being used across the state and how to contact partners engaged in STEM education. Additionally, it has resources for community maker spaces, and activities for home, and more. Each of these activities will be supported with video instruction, common mistakes, technical support for common maker tools, and a space for teachers to request connection with industry professionals. Lesson plans shared on the spaces have largely been provided by funded grants, including classroom grants, professional learning grants, and computing partnership grants. The resource library can be found at https://stem.utah.gov/resource-library/ .

(i) Keep track of how the best practices database is being used and how many are using it - 63M-1-3204 2 (k) i and ii

The STEM AC website continues to draw more and new visitors. From July 1, 2023 to June 30, 2024, stem.utah.gov saw 43,101 users and 114,946 page views. Those numbers increased by 36% and 19% respectively over FY24. The STEM website continues to be a reliable resource for educators, students, parents and industry professionals looking to engage with STEM education in Utah. Facebook reach for FY24 was 377,512, up 15% from the previous year. Instagram reach was 26,231 (down from FY23). There were a total of 8,541 contacts in Emma, the Center's newsletter service.

(j) Join and participate in a national STEM network - 63M-1-3204 2(l)

The STEM AC had determined that resources can be accessed readily without paying for membership in the national organizations such as STEMx or STEMConnector. There are greater benefits to attending key conferences or symposia to engage with the larger network of state STEM leaders. Further, several of the national organizations have become more membership focused and less about providing services, which diminishes the role that they can play for an organization such as the STEM AC. However, there have been recent changes with the national organization STEMx and they have restructured membership to be free of charge. The STEM AC is now a regular participant with the STEMx community and it has been a good opportunity to further relationship development with other STEM organizations and communities.

(k) STEM School Designation - 63M-1- 3204, 2 (n)

The STEM AC, working with the Utah State Board of Education (USBE), generated a comprehensive plan for a STEM School Designation program, which was included in the FY15 annual report. The USBE and the STEM AC Executive Board approved the criteria in FY15. Over the course of applying for designation, schools complete a self-evaluation on 10 overarching dimensions, encompassing 37 elements. Each element is evaluated by the applicant school and scores are supported with narrative and artifact evidence submitted to the review committee. The review committee is composed of STEM AC staff, as well as administrators planning to apply the following school year, in addition to each applying school providing a reviewer as well. It is important to note that the application to become a designated STEM School is not easy. It takes time and considerable effort to complete the application portfolio. In FY24, five schools that had previously been designated as STEM Schools were re-designated, along with six new schools receiving designation this year as well.

Designations are recognized for five years, requiring a school to reapply at the end of that time to maintain the designation. For schools that use reviewer feedback to create and implement improvements within those five years, a modified application process is used to increase the designation level. A summary of the designees can be found here:
FY24 Current STEM Schools

Moving forward, program leaders have started a multi-state consortium that meets quarterly to discuss challenges, barriers, and lessons learned with STEM designation programs across the nation. Additionally, work has been started to create an additional STEM & The Arts Designation, which has been repeatedly and strongly requested by schools and communities. This will use the same STEM Designation components, with additional Arts components supported by the Beverly Taylor Sorenson Arts organization. Finally, the program leaders are working with the Utah STEM Foundation to raise funds to establish a STEM School Designation grant program to fund competitive applications that target key areas of focus in the STEM School Designation applications and accompanying strategic plan.

(l) Support best methods of high-quality professional development for K-12 STEM Education - 63M-1-3204 2 (o)

Local Education Agency (LEA) Designed Professional Learning Plans

The STEM AC supports LEA-designed effective professional learning projects through a competitive grant application process. Funded projects must align to the Utah Effective Teaching Standards (UETS) developed by the Utah State Board Education (USBE). Additionally, all funded proposals must align with the definition of highly effective professional learning, as defined in HB 320 from the 2014 general legislative session. All grant participants are required to (1) work toward improved STEM-related instruction and (2) promote reflective practice. For the current two-year cycle, a significant change was made to the application cycle, requiring applicants to state their PL goals as part of their applications. Then the external evaluators have used those goals as part of their personalized mid-year and end of year program assessments. Requiring the goals upfront was anecdotally reported to be cumbersome, and did deter some last-minute applicants but the funded proposals were scored very highly by reviewers and had greater clarity, and have had greater adherence to their plans than in former years at this point, one year in, to their plans. Additionally, monthly instead of quarterly webinars were instituted for grant managers. The webinars have been viewed positively for those that have attended. FY24 PL grantee awards can be seen here: FY 24 PL Awards for reports The full program evaluation can be seen here:
2023-24 STEM AC PL_Annual Report_FINAL (3).pdf

As highlights and lessons learned from this year, there has been a significant increase on the focus of effective student discourse, and supporting teachers in learning how to facilitate academic conversation with students at all ages this grant cycle. Educator feedback was informative and positive.

"I think the most beneficial for me is when we watched the professional development person go into one of our classrooms. We all came in there and watched her demonstrate for us. We had a really good idea of what it needed to look like."(Educator, Focus Group)

"Our class sessions were highly impactful models of good teaching. Each session [the facilitator] modeled how to get students to understand and talk about basic math concepts. I grew as a teacher because [the facilitator] helped us reflect on our successes and struggles, learn from other teachers' experiences, and participate in Number Talks as if we were the students. My personal math sense increased. This has helped me be a better teacher for my students." (Classroom Educator, Educator Survey)

Other areas of growth centered around teacher reflection, PL engagement, and educator collaboration. Challenges still exist, and seem to be centered around the time it takes to change instructional practice, as well as the required time devoted to non-STEM content.

"The biggest challenges in our LEA (Local Education Agency, or school district) are related to competing interests. English and Language Arts (ELA) takes the lion's share of planning and professional learning time. In addition, it seems like it is the only discipline that is monitored by the state, district, or administrators. I think the best strategy to support our efforts would be to put STEM disciplines on the leadership radar. To overcome the barriers, we have worked with individual principals in our LEAs to provide just what that schools need." (Site Leader, Spring, Implementation Survey)

Overall, educator participants are very satisfied with their participation, and feel encouraged and re-engaged with their profession. They reported feeling more effective and willing to learning. As an example

"I actually wanted to quit before last year. And [our site leader] gave us this book and it energized me more to think differently. And then I am way more energized to stay in the profession than I have been ever. I actually left the profession for a while and then came back. So I think on a personal level, it made us more engaged and happy to teach math. I feel happier teaching math now." (Educator, Focus Group Interview)

STEM Education Innovators (SEI)

Over the past several years, the STEM AC has worked with multiple partners to develop a teacher-level professional learning series entitled STEM Education Innovators (SEI). This experience will allow participating teachers to:

1. Address local Problems of Practice with educators across the state
2. Align their work with school and district initiatives and improvement plans
3. Develop and expand STEM content knowledge and STEM pedagogical skills
4. Engage in reflective practice
5. Increase capacity as teacher leaders and mentors

While engaged in the five-year program, teachers must maintain active teaching status. Recruiting for this program took place in fall of 2022 cohort participants were identified in FY23. The cohort consists of 43 educators from across the state. This cohort is composed of secondary teachers, and has a mix of Science, Mathematics, and CTE teachers. Each educator receives a stipend for their off-contract work, and also receives funds to pay for materials for their Problems of Practice.

This cohort meets synchronously once per month via Zoom. Sessions are facilitated by the STEM AC program manager and Utah Education Policy Center (UEPC) Bridgeworks team, and the sessions focus on teacher leader skill development. They are designed to have all participants teaching and learning from each other. Breakout groups are used extensively and feedback is asked for after each session in a short anonymous survey. The facilitation team then

meets a week later to review the feedback and implement suggestions for the next meeting time. This model has been very successful. After one year of the five-year cycle, SEI has been positively received based upon the qualitative data collected. Another cohort, the next being made of elementary teachers, will start when the first cohort is in years four and five. The first cohort will mentor the second cohort. The full report can be found here SEI Cohort 1 Evaluation Report (1).pdf, and selected quotes from participants can be found below:

"This is a group of teachers that really care about students, improvement, and are dedicated to their work. Gaining thoughts and insights from others has been incredibly beneficial and added to my teaching and teacher leadership practices because I can use their ideas to get the ball rolling or see resources that I haven't used before."

"My participation in the program highlighted my desire to improve my math curriculum to incorporate cross-curricular lessons and aim to offer opportunities for students to improve their STEM identity, and not just their math identity. . . I also was able to frequently gain insight from other teachers on ways to incorporate what they're doing or thought of how to address their challenges, which continued to spark ideas for how I can improve my teaching."

"I have been a more vocal proponent of addressing school issues in a proactive way vs. dealing with a problem after the fact. For instance, poor student attendance has been an issue at my school. I advocated for changing our messaging… as well as dealing with problems of poor attendance afterward. "

(m) Recognize a high school student's achievement in STEM Fairs, Camps and Competitions- 63M-1-3204, 2 (p)

The STEM AC highlighted many student achievements on social media pages, including our intern Emma Casey, who is instrumental in helping us organize Pop Up Maker Faires, and AmeriCorps Member and volunteer Quinn Konnick, who helps run events in the Innovation Hub.

In addition to these programs, the STEM AC showcases the work of students, educators, community and cultural organizations, other state agencies and industry partners around the state using website and social media resources. It is the responsibility of the Center to not only promote the work the STEM AC does, but also the work students, educators, companies and communities are doing to support and promote STEM all over the state.

(n) Develop and distribute STEM information to parents of students being served by the STEM AC - 63M-1-3204, 2 (r)

The STEM AC reaches out to parents at various STEM events, such as the Craft Lake City DIY fair, STEM expo events, and other sponsored events. Parents are encouraged to sign up for the newsletter and to follow the STEM AC on social media, where they can learn about STEM events across the state and student grant opportunities. The annual STEM Fest provides engaging opportunities for families to attend on the open Family Night. A specific section on the website is dedicated to students, where parents and students both can learn the significance of STEM and also keep up to speed on the latest events.

The MILO and Friends math program is designed to support parents and caregivers in early math support. The STEM AC team engages directly with parents and caregivers to review free math resources with them and determine how to best support their efforts with their children at home. The MILO program is discussed in greater detail in a following section.

Parents are frequent participants in the Innovation Hub with the various classes and Tinker Time. The STEM AC supports events hosted by other partners such as Club Ability and STEM Nights

hosted by schools that target parents in a variety of Utah communities.

(o) Support targeted high-quality professional development for improved instruction in education, including improved instructional materials that are dynamic and engaging and the use of applied instruction - 63M-1-3204, 2(s) i - iii

In the 2023-24 school year, educators and administrators from 741 schools received professional learning for the use of the K-12 Math Personalized Learning tools as part of the contracts with the product providers. This training ensured that educators were able to integrate the use of the software effectively as a supplement to their instruction.

The STEM AC initiated a new project that supports online access to high quality STEM resources. The STEM Resource Library includes lessons for teachers, links to online resources, career videos, and more. Additionally, it will have resources for community maker spaces, and activities for home and community spaces. Each of these activities will be supported with video instruction, common mistakes, technical support for common maker tools, and a space for teachers to request connection with industry professionals.

While most caregivers know how to compare large and small, and how to count to ten, they don't know they should be practicing early math skills while they play with early learners. Kindergarten math entry scores predict future math scores, reading scores, and even college and career success. In FY23, the STEM AC officially launched the Math Introductions and Learning Opportunities (MILO & Friends) program to help make math fun for Utah families. As part of this effort, the STEM AC has partnered with organizations like Wheeler Farm, the Living Planet Aquarium, and Tracy Aviary to embed math focused signage, scavenger hunts, and activities in public spaces so that parents see that early math play is important, fun, and achievable. The STEM AC has also partnered with family engagement centers, preschools, libraries, and other community organizations to host family math events. These events typically serve 30-50 families at a time, and caregivers leave with fun, engaging math activities for early learners. The STEM AC has also created a dedicated page for MILO & Friends, allowing caregivers to find ideas, activities, tips, and tricks for how they can make math fun for their early learners. To help research the impact of these resources, the STEM AC has partnered with University of Utah Pediatrics to write a seed grant for the Nurturing Numeracy program, in which pediatricians provide information and resources directly to caregivers of early learners at well check appointments.

(p) The Board may prescribe other duties for the STEM AC in addition to the responsibilities described in this section - 63M-1-3204, 3

COMPUTING PARTNERSHIPS/COMPUTER SCIENCE INITIATIVE

In 2017, with strong support from industry, the STEM AC secured ongoing funding to launch the first computing grant initiative in Utah, now known as the Computing Partnerships Initiative. Since the initiative began, input from STEM AC partners and third-party evaluators have informed funding opportunities and defined the criteria for the grant framework and proposal activities, which address the resource gaps preventing LEAs from offering cross-curricular computing programs in pre-K to 12th grade. This input has defined a needed shift to a greater focus on innovative and integrated computing which can serve the increasing need for earlier and effective engagement. It has also emphasized the strategies of maker learning activities, work-based learning opportunities, out-of-classroom opportunities .

FY24 applicants were required to align with two or more Key Elements, as defined in the Request for Proposals:

- Outreach and student engagement activities through before and after school and summer programs (e.g., robotics and other clubs, innovation/maker spaces, summer

camps, etc.)
- Industry involvement, such as mentorship of out-of-classroom programming
- Post-secondary and community collaborations
- Integration efforts between out-of-school programming and classroom learning
- Innovative Pre-K enrichment activities related to computing that emphasize parental involvement and kindergarten preparedness, and
- Activities which promote increased access and broadening participation

The FY24 Computing Partnership grants were identified through a formal, competitive solicitation with an external review of all submissions. From 27 completed submissions, There were 18 grants, from 27 completed submissions, awarded. Seventy-one percent of these awards were located outside of the Wasatch Front. Of the $1,053,305.62 awarded in FY24, $586,303.51, or 56%, were awarded outside of the Wasatch Front. An outline of the grantees and their funded activities can be found here: FY 24-25 Computing Grantees and Activities

Qualitative and quantitative data were collected from grantees in January 2024 and at the end of the school year. Third-party evaluation analysis provided by the Utah Education Policy Center (UEPC) indicates positive outcomes and provides formative guidance regarding how to improve the program and identify future, additional needs. The full FY24 Evaluation Report can be found here: Evaluation of Computing Partnerships Program

During FY24, activities in the first Key Element, outreach and student engagement, showed beneficial student impact. Innovation & Maker Spaces served approximately 5,912 and 6,206 students in the fall and spring, respectively, and 6,127 and 4,912 students participated in out-of-classroom experiences. In addition, approximately 661 preschoolers were impacted through pre-K enrichment activities. (Note: students may have participated in more than one activity.)

Grantees identified strategies that best addressed the specific integrated computing needs of their school or district. Educators most frequently identified Out-of-Classroom Experiences (19%) and Innovation & Maker Space activities (51%) as meaningful for students. (Please note that these two activities were the most common across all grantees.) UEPC reported that the Computing Partnerships grants were associated with numerous positive student outcomes, including computing interest and computing identity. Educator ratings demonstrated a 22.34% increase in student computing interest, a 27.88% increase in student computational thinking skills and a 29.33% increase in student computing identity from the first to the end of the school year. The majority of educators also reported positive outcomes for themselves. The UEPC reported that "Participating educators expressed high levels of agreement with statements assessing their increased valuing, interest/enjoyment, and teaching confidence, related ti cinyotungm engineering and technology."

The following grantee and educator survey and interview responses, as aligned to key elements outlined in the proposal requirements, indicate the strong impact of the Computing Partnerships activities.

Innovation and Maker Spaces

- "We have seen measurable increase in the computing skills of students at various grade levels, as well as instructors. We are successfully utilizing near peer mentoring to provide with youth role models. We have found that the youth mentors also help increase confidence in adult instructors, as the adults don't feel like they have to know everything."
- "The STEM Computing Partnership grant gave us the ability to purchase initial supplies to create a maker space and also allowed us to accumulate an initial supply of robotics materials for the students who will be participating in our first robotics endeavor."
- "STEAM Makerspaces- We currently have 5 of 8 Middle Schools implementing Makerspaces based on this grant, and I have 1 that I am meeting with on Tuesday to get

her school started. While the librarians at the middle schools were doing a bit with makerspaces prior, the grant provided them the resources to make their spaces more robust. We have 5 elementary schools implementing them, which have never hand makerspaces before. One of these 5 has now gone a step further in calling themselves a stem school where they are incorporating STEM into Friday activities as well as having 8 teachers from the school join our district's STEM endorsement."

Out-of-Classroom Experiences

- "We have integrated several new out of school time activities to help increase STEM/computing identity. Some of these include pixelations, robotics, drones, and engineering design classes. Offering STEM training in these areas have added to our success. Our partnership with USU has been key in increasing knowledge and confidence of instructors to provide these experiences." "We have a fully funded Girls Who Code program that is free for students and facilitated by volunteers in our after school program. One of our science teachers works with our after school program to teach a basic and advanced robotics class. We are also planning to continue these robotics classes during our summer program. We have used funds from this grant to purchase items to support our after school experiences."
- "Robotics: The robotics class exposed students to the exciting world of robots and drones. They learned to design, build, and program robots depending on age and grade levels. Technology: The technology class delved into various aspects of technology, including computer skills, coding basics and digital literacy."
- "Some of our key success related to completion of this objective is to have successful after school clubs such as coding, robotics as well as other STEM related activities in our school. We have been collaborating with our intermediate, middle and high school in our area for resources and peer mentorship. We are working toward hosting a whole district STEM night at our high school. Our summer STEM camps are really well attended. We have 90 students from all over the Hurricane Valley attend our camps."

STEM Action Center as the Intermediary

- "The STEM Action Center staff and the organization is ALWAYS available to answer questions and to help us, we do not always need assistance but we know we can count on them if we do need help."
- "The STEM Action Center has been very gracious and willing to help us get our schools up and running with our out-of-classroom activities."
- "I cannot express how important this money has been to get the results we've been able to get. This is a HUGE investment but being able to impact over 4,000 students and provide them with quality instruction in Computer Science is huge. The investment in the lower grades has FORCED, in a good way, the high schools and junior highs to be able to offer higher level CS pathways because students are coming to them more literate in Computer Science. Students report that STEM is their favorite class in school!"
- "I love the resources available that the STEM Action Center provides such as their website, lessons, and especially their makerspace!"
- "I feel that the STEM Action Center has provided support for our area above and beyond what we have expected. We have had a wonderful working relationship with the STEM Action center."
- "I am always grateful for the STEM Action Center. The grants we receive impact rural Utah students on a daily basis."

During FY24, the STEM AC provided monthly webinars and connections with technical experts to assist grantees in establishing their maker spaces, meeting specific equipment needs, and exploring sustainability options. Grantees shared their progress and best practices, offering other grantees the opportunity to learn and open a dialog on specific program aspects. During FY25, identification of

additional webinar topics and technical assistance will continue to build the community of practice for grantees and prepare for the sustainability of their projects.

Outreach, Engagement and Partnerships
There are numerous outreach, engagement and partnership development activities that are included in previous sections, such as the industry engagement portion of the report.

The STEM AC partners with numerous organizations and industry partners. The following are a few examples of partnerships:

- Talent Ready Utah is a co-lead for a Bioindustrial Manufacturing grant with BioMADE, a manufacturing institute under the US Department of Defense. The purpose of the grant is to support outreach and engagement, classroom activities and work-based learning opportunities for biotechnology high school and post-secondary students to explore education and careers in biotechnology.
- Continuing work with the USBE as part of a STEM Advocacy Team to collaborate on STEM-related projects The Advocacy Team collaborated to create a STEM Advisory Committee that launched in FY24, which then created the State STEM Collaborative (SSC). The SSC's first state-wide meeting was held in May, 2024. It will move forward with three meetings each school year.
- bioMerieux, a life science company, awarded the STEM AC a 3-year grant to support Micro STEMFests, Inventioneers of Today and Tomorrow and the design and implementation of the Pop Up Maker Faire program. The grant runs on the calendar year thus the impact number for FY24 are: MicroSTEMFest: 29 schools and almost 3000 students; Pop Up Faires: 2666 students and 10 Faires, with 30 hours of industry volunteer engagement; Inventioneers of Today and Tomorrow in partnership with Utah State University): 1749 students participating in the pilot year.
- Green Our Planet to pilot high school - community hydroponic farms on the Navajo Nation (Monument Valley and Navajo Mountain),the Ute Mountain Utah Nation and the Paiute Indian Tribe of Utah in FY25 (see below).
- The STEM AC is partnering with pediatric clinics in the University of Utah and Intermountain Health to share MILO and Friends early math resources with parents of young children to support their nurturing of early math at home.

Utah STEM Industry Engagement – Utah STEM Industry Coalition (USIC)

- The Utah STEM Foundation oversees the Utah STEM Industry Coalition (USIC) which meets 3-4 times per year and consists of approximately 75 companies from throughout the state. The USIC focuses on identifying volunteer and sponsorship opportunities to support STEM efforts for the STEM AC and its partners. Several programs have benefitted from the support of the USIC including robotics teams (coaching support), STEM Fest (sponsorships), the mySTEM program (formerly the Chief Science Officer program), Tinker Totes and STEM Spots (construction and financial support).
- The STEM AC continues to partner with Talent Ready Utah (TRU) to engage industry and support the volunteer and sponsorship needs of numerous programs across the state. Specifically, the STEM AC is working with TRU to align the Center's programs with the Adopt-A-School initiative.
- The STEM AC received a $200,000 grant from bioMerieux to support Micro STEMFests, design and implement the Pop Up Maker Faires and launch the Inventioneers of Today and Tomorrow (the Utah version of Invention Convention).
- The STEM AC has received funding for our Hydroponics programs from Texas Instruments, Marathon Oil, Common Spirits Health, Northrop Grumman, Meta, as well as private donors (over $100,000).hydroponics
- Tinker Totes is an industry-led opportunity to fund and assemble DIY engineering kits for youth in the community. Donated funds to the Tinker Tote Program in FY24: $28,000

The Tinker Totes that were assembled went to: American Indian Services, Utah Foster Care, Mary W. Jackson Elementary, SLCC and Verizon's Innovation Learning Summer Camp, Common Thread, and an internal focus group to improve the Tinker Totes content.

Green Our Planet Hydroponics

- The Green Our Planet (GOP) Utah hydroponics project is an innovative program that utilizes high-tech hydroponic systems that support STEM learning across numerous disciplines. The program inspires students to become the next generation of scientists, engineers, farmers, chefs and entrepreneurs.
    - There are currently 11 libraries, off of the Wasatch Front, who are participating in the GOP hydroponics program. These libraries are in the following cities: St. George, Washington, Enterprise, New Harmony, Springdale, Hildale, Minersville, Moab, Blanding, Monticello, and Parowan. The library programs are in their third year of implementation and continue to be successful in their communities.
    - There are currently 47 (9 new ones for the FY24) schools participating in the GOP hydroponics program. Of those schools, 16 of them are off of the Wasatch Front. The feedback from implementation has been overwhelmingly positive and expansion of the program is underway for FY25.
    - A pilot of an innovative high school - community hydrofarm program will begin with the delivery of multiple units to the Navajo Nation (Monument Valley and Navajo Mountain) and the Ute Mountain Ute Nation (White Mesa) in September of 2024. Partnership conversations have begun with the Paiute Indian Tribe of Utah in Cedar City, UT.
    - An additional pilot, a Youth Farmer's Market is being planned in collaboration with Green Our Planet in the Salt Lake Valley during April 2025. An estimated 5-8 schools will sell their produce and other produce-related maker items. GOP's Financial Literacy curriculum will provide students with applied learning regarding pricing, cost and Proceeds from the Market will return to the schools to fund their programs.

STEM Volunteer Program

- According to our tracking software, in FY24 there were:
    - Online Program Views: 55,133
    - New Volunteer Registrations: 594
    - Volunteer Hours: 1983.03
    - Opportunities Responses: 648
    - Approximate Labor Value of Volunteer Time Served: $50,071.52

- Table comparison of FY24 to FY23:

	FY24	**FY23**	**% Change**
Online Program Views:	55133	1014	5337.18%
New Volunteer Registrations:	594	319	86.21%
Volunteer Hours:	1983.03	886.9	123.59%
Opportunities Responses:	648	292	121.92%
Approximate Labor Value of Volunteer Time Served:	$50,071.52	$22,394.23	123.59%

Chief Science Officer (CSO)

The Chief Science Officer (CSO) program is a school-based program that is similar to a Student Body Officer program but with a focus on supporting STEM education. The program supports a group of students, or CSOs, that create a CSO Action Plan that will incorporate 1-3 STEM activities, opportunities or new resources for the school or the community. In FY24, 32 students completed the Leadership Training Institute, the first required step in CSO training. Despite regular email check-ins with students and their teacher mentors, completion of reports and other required milestones was unsatisfactory. Additionally, students had been very excited during initial training when they had been onsite at the STEM AC, but once they had completed training and were no longer coming to the physical STEM AC location, participation dwindled. The STEM AC staff designed a new version of the program, titled mySTEM, to begin in FY25. This version of the program will still be in partnership with CSO International, but will allow students to come to the STEM AC, be mentored by STEM AC staff and the STEM AC Innovation Hub AmeriCorp members, and will focus their action plans through a service-learning lens.

Week of STEM

- The second annual Week of STEM was November 6 - 10, 2023. The focus was highlighting innovation, invention, and making, and showing how STEM allows us to create and invent. Our goal was to show how we are all makers. We held a kickoff event on Nov. 6 at Checkerspot, where undergraduates participated in the "Makers for All" competition. The students created interactive STEM learning tools for students who are sight impaired. We also showcased a new video series that highlighted five Utah makers: Fred Conlon who is a welder, Jessica Nichols a medical innovator, Robb "Little Owl" Martin who is a Native American flute maker, Radhiha Shankar, a jewelry and recycled materials art maker, and Spencer Loveless, an innovator in 3D printing. During the Week of STEM and shortly after (Nov. 6 - 20), there were 4,027 visitors to the STEM AC website, with 85% of them being new website visitors. The highest page views were the home page, Week of STEM page, and Resource Library page. There was good engagement on social media channels as well. Facebook saw a 900% increase over the same period in previous year, and Instagram reach was up 186% year over year.

- The third annual Week of STEM will open on November 4, 2024. The theme is STEM in the Arts. The STEM AC, in partnership with the Utah Innovation Hub Network, are organizing and hosting the first maker learning conference in Utah: MakerCon. MakerCon will be hosted at Utah Valley University and provide opportunities for educators and community members to learn about innovative approaches to formal and informal education using maker learning strategies. We will also have a robust social media campaign showing how STEM plays a part in the arts with a video series and the new edition of the STEM magazine.

STEM Spots

- The STEM AC has partnered with the STEM Coordinator of USU Extension/4-H to build and establish Utah STEM Spots. These small, stationary enclosures act as outreach posts where community residents are encouraged to engage in a *Take-Enjoy-RETURN-Repeat!* model. Communities decorate the structures and determine where to install the STEM Spots, providing underserved residents easier access. STEM Spots contain materials (books, To Learn Kits, 4-H kits, etc.) that emphasize Science, Technology, Engineering, Math and the Arts and promote STEM to all ages, preschool to adult. Industry partners that have contributed to the book costs and building include: Northrop Grumman, Griffis Institute, Dominion Energy, Hill Air Force Base,Comcast, Progressive Leasing, and Jacobson Innovation. At the time of this report, at least 56

STEM Spots are installed statewide, with 10 more sites designated. Of those installed, 79% are in communities off of the Wasatch Front.

- Feedback
  - *"I had a young Hispanic mother thank me…her sone is checking out the books on a regular basis and his reading skills are getting better and better, because he is reading about things he likes to learn about…He was non-English speaking when he moved to my county."*
  - *"The Paiute County nurse sends kids out of her office to our STEM spot when she needs to work with the parents…by the time the parents are done the youth do not want to leave the area and argue about staying."*

Utah Innovation Hub Network (UIHN)

- The STEM AC opened the doors of its Innovation Hub to the public in June of 2021 with the original intention of supporting competitive robotics teams as a place to design, build, and connect. Through serving robotics teams over the course of the 2021-22 competitive season, the STEM AC recognized the higher-than-anticipated need for hands-on, personalized and integrated STEM opportunities, like those found in maker education.

  FY23 saw an advancement of high-impact maker focused programming in the Innovation Hub and increased demand for already existing opportunities. In August 2022 the Utah Innovation Hub Network (UIHN) AmeriCorps program began, allowing for enrollment of up to 40 AmeriCorps members to be placed in makerspace Hubs across the state. This program has allowed for a dramatic increase capacity of not only the Innovation Hub, but of the entire Utah Innovation Hub Network which includes Utah Valley University, Utah Tech University, Southern Utah University, Davis Catalyst Center, Make Salt Lake, Salt Lake Community College, Utah State University, and Snow College.

  In FY2024, the Innovation Hub continued its facilitation of the Utah Innovation Hub AmeriCorps program. AmeriCorps members enrolled in the program typically serve a service term of a calendar year, and in FY2024 the Hub saw many AmeriCorps members finish their service term. Members stationed at the Innovation Hub at the STEM Action Center's office saw a re-enrollment rate of 67%.

  The high re-enrollment rate of AmeriCorps members has lead to an increase in creation and participation of innovative programming facilitated by AmeriCorps members. In addition to an increase in Tinker Time capacity, the AmeriCorps team was able to build out the following programming:

  - *Makerspace Exploration:* In FY24, the Innovation Hub facilitated 3 sessions of a 15-week introduction to makerspace skills. This class focused on exposing K-12 students to tools like 3D printers, laser cutters, CNC machines, and circuitry and programming.
  - *My Chemical Beauty:* In partnership with Glycosurf, Inc., this program focused on the chemistry behind making beauty products.
  - *Maker Burst Series:* These classes focused on more intermediate and advanced makerspace skills on equipment like 3D printers, laser cutters, and CNC machines.
  - *Earth Month Series:* Every Friday in April, the Hub team held workshops on maker projects aligned to Earth Day. Participants learned about biomimicry, vermicomposting, creating sustainable terrariums, and carving alabaster.

- *Invention Series:* The month of May focused on inventions as the AmeriCorps team guided participants through the reconstruction of inventions like th loom, telescope, printing press, and compass.
- *STEM Dungeon Master Bootcamp:* STEM And D&D fused as we trained participants on creating 3D printed dice towers, designing high-quality, realistic maps, and vacuum forming.
- *Intro to DIY Robotics:* Participants created robots from scratch using an Arduino microprocessor and custom-designed 3D printed parts.
- *Tinker Time:* The Innovation Hub maintained an increased capacity of 80 participants for our Tinker Time opportunity. The Innovation Hub also maintained the facilitation of competitive Robotics opportunities throughout the September - May robotics season. Several of the teams we supported in the Hub did exceptionally well at the state and regional competitions in Utah.

Acquisition of STEM education-related instructional technology program – Research and development of education- related instructional technology (63M-1- 3205

K-12 Personalized Math Software

The STEM AC completed its tenth full year of training and implementation to support the K-12 Math Personalized Learning program (2023-24 school year). The overall goal of this program is to provide supplemental math support to educators and students in an innovative approach that includes: (1) ongoing research of best practices in the use of supplemental instructional tools (2) using a statewide approach to design and implement a robust analysis of the use of content specific supplemental technology-based tools and (3) a statewide approach to implement a program that leverages state contracting and critical mass for cost-effective access.

The fact that Utah teachers already had access to, and familiarity with, high quality digital math learning tools when the pandemic hit helped Utah's eight grade math scores hold steady during the pandemic while math scores in every other state plummeted (https://www.nationsreportcard.gov/highlights/mathematics/2022/#region-state-district-performance-grade-8). Utah now has more 8th grade students reaching grade level math proficiency than any other state.

A total of 142,102 students had access to licenses in FY24 provided by the STEM AC for math personalized learning tools. The program covered more than 20% of all Utah students in grades K-12, with 103 LEAs participating (741 schools total). Nine math personalized learning products were used during the 2023-24 school year. Buy-in at all levels is critical to success, and for each application a signature from one district-level admin and one school-level admin is required. Administration promised to ensure that students have access to technology for at least 45 minutes per week to use the math software provided. Signatures were also required from the IT Director at each LEA to ensure they were aware of any technology provided by the grant and that they would have adequate bandwidth and infrastructure prior to implementation. Each year on-site professional learning opportunities are required from product providers for classroom educators to increase buy-in at the teacher level and ensure classroom teacher participants are comfortable with the products they will be using over the course of the year.

All applications are required to list "on-site" contacts, which are verified by the district point of contact before the beginning of the school year. This ensures that product providers are able to distribute the majority of awarded licenses and facilitate professional development right at the beginning of the school year. Product providers are required to distribute licenses and arrange professional development before they receive payment, which has encouraged them to

put forth extra effort to ensure timely completion of these activities. The STEM AC also ensured that usage expectations were clearly communicated to administrators and math coordinators.

To allow school and district administrators to more strategically plan implementation, the application is opened for the following school year early in the spring and send award notifications in April before budgets have to be completed. As this program has matured, it has been found that there is a difference between "fidelity"- using a product for a certain amount of time - and effective implementation. When working to ensure products are used effectively with over 100 thousand students, the easiest metric to look at is minutes of use. While it is known that greater usage is correlated with greater student achievement, this metric does not provide a complete picture of what effective usage looks like. Over the past couple years, the data has shown that human connection is the single most significant factor related to student performance in math. As the STEM AC team has worked to emphasize the importance of using these supplemental products strategically to facilitate better human connection between educators and students, administrators all over the state have expressed their support for this approach and their gratitude toward the STEM AC for understanding the important role of the teacher in high quality math instruction.

To better understand the role of teachers in effective software use, the STEM AC has partnered with the Utah Education Policy Center to evaluate "best practices" around software implementation in classrooms. In FY23 valuable lessons were learned and confirmed that teachers are in fact a significant variable in predicting the efficacy of math software. Students do better when they perceive high levels of support from teachers, and teachers using software report higher rates of teacher practices that help students feel supported. Students using software also have higher rates of persistence. In FY24, the STEM AC asked the evaluation team to focus their efforts on understanding how various practices of teachers using software related to student outcomes. Results from the School Year 2023-24 evaluation report suggest that when teachers set mastery based goals (rather than time based goals) it has a significant positive impact on student attitudes and achievement. The report also highlighted the potential positive impact of using data from software to reflect on and discuss learning with students, giving them a sense of control and autonomy in relation to their own learning path. Teachers we more likely to engage in these effective practices if they consistently had access to the same software for several years. These are all very actionable and exciting findings, and we have already begun building this information into our training for teachers and administrators, and sharing these findings with product providers so that they can improve their own training. For the full report, see
https://stem.utah.gov/wp-content/uploads/2024/11/FINAL-Best-Practices-2024-Report.pdf
Results have also been published in the Journal of Research on Technology in Education. This research helps to fill a significant gap by examining effective teacher practices related to software use. For the full JRTE article, see
https://stem.utah.gov/wp-content/uploads/2024/11/Math-best-practices-article.pdf

Math Mentors

Year after year, class sizes grow and it becomes increasingly difficult for students to get the direct attention that will help them reach grade-level proficiency. Few resources are specifically designed to target the needs of struggling students who aren't identified as students with special needs. As a result, they slip farther and farther behind until, by eighth grade, in spite of consistent positive impacts of software over the past 9 years, only 35% of Utah students are reaching grade-level proficiency. That puts Utah tied for number one for best performing state in math nationally, but there is still work to do. Math is the biggest predictor of students' future academic and career success, even after controlling for reading skills, attention skills, socio-economic status, and socio-emotional behaviors, and eighth grade is the 'deadline' that most accurately predicts success in college and beyond.

The biggest obstacle to fostering greater human connection around mathematics in schools has been an insufficient number of adults in Utah classrooms. In FY20, the STEM AC received an AmeriCorps planning grant for a program designed to bring Math Mentors into classrooms and in FY21, AmeriCorps awarded the STEM AC a full operational grant to build out the program. This program represents the next step for the K-12 Math Personalized Learning program, working with AmeriCorps members and industry partners to provide evidence-based interventions to Utah students who are struggling in math. The program design incorporated design components seen in other successful mentor-based programs for reading and math in other states. AmeriCorps members provide in school mentoring in grades 4-8 using math personalized learning software to help students improve math performance and build important skills for academic and career success. This program helps local communities respond to gaps in education amplified by the COVID-19 pandemic, while actively addressing and removing inequities, including those related to race, gender, educational outcomes, and digital access. Efforts are focused on communities with low performance and limited resources, delivering measurable service and significant impact to areas of greatest need. AmeriCorps members also facilitate recruiting and training of local volunteers to build capacity and sustainability.

The main purposes of this project are to: 1) increase the number of Utah students reaching grade-level proficiency in mathematics, 2) improve students' confidence and persistence in mathematics, and 3) sustainably increase the number of mentors in classrooms. In the 2023-2024 school year, 73% of AMMP students maintained or increased their confidence in math, 76% maintained or increased their interest in math, and 78% maintained or increased their effort in math. This is particularly significant given evidence that many students experience declines in confidence, interest, and effort from the beginning of the school year to the end of the school year. In addition, 83% of participating students indicated that their mentor helped them learn "quite a bit" or "a great deal" in math. Although sample sizes for the 2023-24 school year were not large enough to find statistically significant relationships between mentoring and achievement on state-level standardized tests, these analyses indicated that the program was successful in reaching struggling students. Moreover, the pattern of results was in the predicted direction with AMMP participants showing stronger achievement gains than similar students who did not participate in the program, especially when students received substantial amounts of tutoring. For a full report, see https://stem.utah.gov/wp-content/uploads/2024/11/2024-AMMP-FINAL-Report-Compressed.pdf.

MILO and Friends

In 2022, strategic planning efforts with partners and stakeholders throughout the state revealed another significant gap in math education became apparent. Stakeholders indicated that there is a dearth of STEM early learning resources for children aged 0-5, particularly in Math.

This is concerning, because research indicates that math scores entering kindergarten are the most significant predictor of future math scores, reading scores, and long term academic and career outcomes. Kindergarten math entry scores are a more reliable predictor than socioeconomic factors, parent education status, students' disability status, and socio emotional and behavioral factors, which are frequently highlighted as some of the most significant predictors of long-term success. The beliefs, practices, and language of parents and caregivers almost completely explain gaps in student's symbolic and conceptual knowledge of the number system and spatial awareness when entering kindergarten. Research shows that gender differences and socioeconomic differences in early math achievement are completely mediated by adjusting the spatial language parents use to talk to their children, and that parents have a significant impact on whether kids feel they are capable of being successful in math.

Despite this, parents and caregivers often lack access to high-quality STEM resources and information about how to help their children gain the skills needed for academic success. Often societal messaging about math can be detrimental to early confidence for girls and children from minority backgrounds. Addressing the awareness of cultural, racial, and class biases is important to how STEM participation is encouraged and nurtured in children. Children have a natural curiosity, and they need adults to foster and guide their STEM abilities.

In FY22 The STEM AC began working with the Community and Cultural Engagement marketing and design team to create a widespread mathematics program systematically designed to empower families to engage with their children in ways that promote the development of numeracy between infancy and age five. The program MILO (Math Introductions and Learning Opportunities) and Friends is adapted from a successful reading program designed and implemented by the STEM education initiative Eastern Washington University. The first iteration of this program was deployed early in FY23 in partnership with Wheeler Farms. Signs were placed around the farm encouraging caregivers to engage in math conversations with early learners as they explore the farm.. Later in FY23, the Living Planet Aquarium joined the partnership to create an early math learning scavenger hunt for families to engage with as they explore the aquarium.

Additional partnerships include LEA-level family and community engagement centers, preschools, libraries, and other community organizations to host family math events. These events typically serve 30-50 families at a time, and caregivers leave with fun, engaging math activities for early learners. More than 90% of respondents who attended these events reported that the event increased their knowledge, interest, and confidence in working with preschool-aged children to build math skills. Participants who spoke Spanish or who spoke English plus one or more other languages had even more positive perceptions of the seminar-style events than English-only speakers. This finding may be attributed to the proactive approach taken by STEM ACs staff to attend to a diverse participant group, including by having surveys and game instructions translated into Spanish.

Attendees also reported large, statistically significant gains from the beginning to the end of the event in their confidence that they have the ability and resources needed to help preschool-age children build early math skills. The greatest gains in confidence were among participants with the lowest levels of education. This finding may result from efforts by STEM AC staff and trained designees to alleviate attendees' concerns about supporting early math learning. Event facilitators achieved this by communicating that engaging in everyday, enjoyable activities with young children – including by counting together, cooking together, and playing games together – helps build early numeracy skills. Conversations with additional community partners to adapt MILO and Friends to new public venues are ongoing.

The preliminary evaluation and assessment findings for the pilot year of MILO and Friends have been promising and will be used to improve the design and implementation of the program. The pilot year findings can be found here:
https://stem.utah.gov/wp-content/uploads/2024/11/FINAL-MILO-2023-Evaluation-Report.pdf

Third-party evaluation report on performance of students participating in STEM Action Center programs as collected in Subsection 63M-1-3204(4).

The STEM AC continues to work with the Utah Education Policy Center (UEPC) to expand beyond basic metrics, to facilitate a more robust analysis that provides greater stratification of the data, as discussed previously.

The UEPC will work with the USBE, mentors, and educators to identify promising practices, assess the relationship between program participation and end-of-year test scores, and

understand attitudes and perceptions of teachers, mentors, and students related to the programs directly administered by the STEM AC. Impacts of the ongoing, as well as new programs, will also be evaluated on a project-level basis. A new report from UEPC highlights promising practices for the integration of supplemental personalized math software for classroom instruction (see https://stem.utah.gov/wp-content/uploads/2024/11/FINAL-Best-Practices-2024-Report.pdf). This report leverages nearly ten years of research and data collection through the STEM ACs personalized math program.