2022-2023
YEAR IN REVIEW

STEM COMMUNITY ALLIANCE PROGRAM

PROGRAMMING & ADMINISTRATIVE SUMMARY

THE UNIVERSITY OF UTAH®

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Executive Summary

The mission of STEMCAP is to forge multidirectional educational and learning exchanges between Youth-In-Custody (YIC), STEM professionals, and art communities. STEMCAP provides scientist-led workshops inside YIC facilities. Scientists share their research and journeys into STEM fields, while highlighting the excitement of cutting-edge research. Workshops also aim to demonstrate that scientists care about the well-being of their communities and raise awareness of jobs in the STEM workforce. STEMCAP's programming seeks to pave the way for YIC to gain meaningful experiences in STEM fields and build self-confidence in their academic abilities while engaging with members of their communities.

In addition to conservation projects and various hands-on STEM programming, STEMCAP provides Art-Science workshops that bridge the gaps between science education and creative expression, narrative, and hands-on art projects. These workshops help break down disciplinary boundaries that might prevent students from understanding the diverse ways they can engage with, communicate about, and learn scientific concepts. Integrating art and science into single workshops that address a central theme or question, STEMCAP engages a broader range of student learning techniques and demonstrates the power of collaborative efforts.

Since 2016, 156 university and community scientists and 13 artists have provided more than 500 STEMCAP workshops at eight YIC centers in and around Salt Lake City, Utah. STEMCAP's student and programming objectives are outlined below.

Student Objectives

SO1. Develop and support curiosity, awareness, and interest in STEM-related fields and research topics.
SO2. Develop mastery of content, academic skills, positive attitudes, and confidence related to STEM educational and professional pursuits.
SO3. Build a deeper understanding of the nature of science and its impact and relation to everyday lives and society.
SO4. Communicate effectively using science language and reasoning.
SO5. Recognize science pathways as personally accessible and achievable as a degree or career.
SO6. Establish relationships with community members.

Program Objectives

PO1. Spark student curiosity in STEM fields.

PO2. Prepare students to communicate effectively using scientific language and reasoning.
PO3. Provide opportunities for students to learn about the study of science and scientific careers.
PO4. Present examples of how students can positively support and engage in their communities.
PO5. Forge meaningful relationships between students, scientists, and community leaders.
PO6. Create a program implementation and evaluation model for YIC- University partnerships that may be transferred to other institutions.
PO7. Support the professional development of USBE YIC teachers.
PO8. Empower students by providing opportunities to contribute to real-world conservation efforts.

Presenter Recruitment and Training

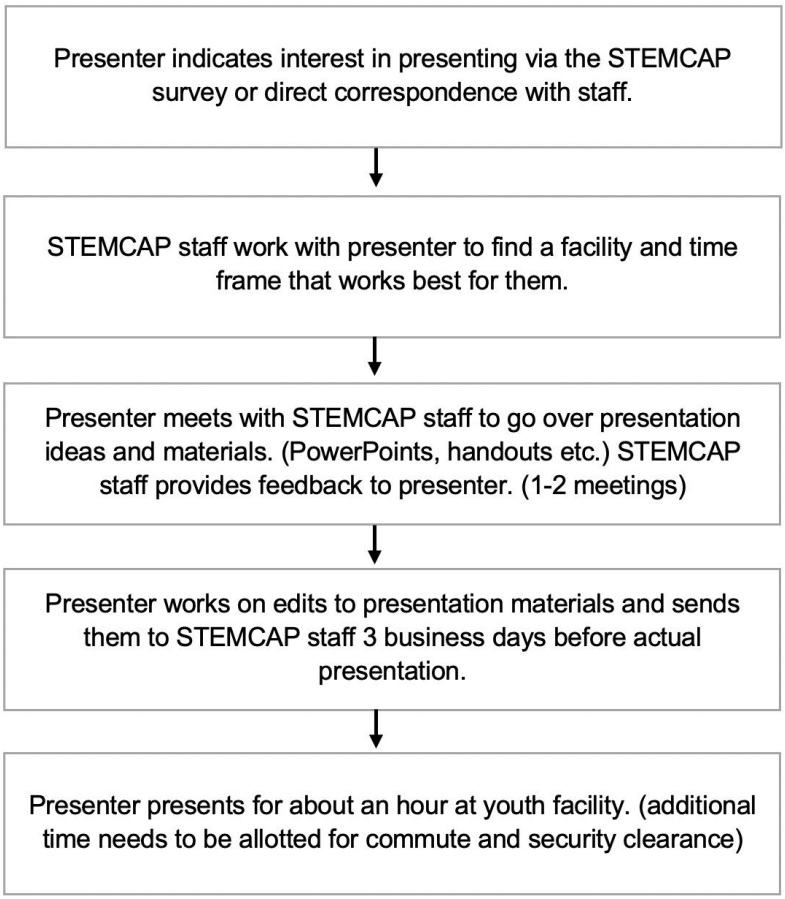


Figure 1. STEMCAP workshop development process

STEMCAP recruits presenters from the University of Utah, universities and colleges nationwide, and local community organizations. *Fig.1* shows the process used to schedule and design workshops. STEMCAP worked with 66 presenters this year, 26 more than in fiscal year 2021-2022. In addition to the process outlined in *Fig.1*, STEMCAP implemented an orientation for presenters for both the Fall 2022

and Spring 2023 semesters. Orientation allowed presenters to learn more about STEMCAP's goals and best practices. It also provided space for presenters to meet with fellow presenters and with teachers from YIC centers before scheduled workshops.

Programming Summary

Throughout the 2022-2023 fiscal year, STEMCAP provided 183 workshops across six YIC centers, comprising 35% of all STEMCAP workshops since 2016. These workshops ranged from single-day topical presentations to two-week series on environmental themes.

5 Youth-In-Custody Centers + Utah State Hospital

- Decker Lake Youth Center (DLYC)
- Farmington Bay Youth Center (FBYC)
- Slate Canyon Youth Center (SCYC)
- Salt Lake Valley Youth Center (SLVYC)
- Mill Creek Youth Center (MCYC)
- Oak Springs School (OSS)

STEMCAP Presenter Affiliations

- 21 University of Utah departments
- 8 University of Utah associated programs
- 2 Independent artists
- 3 Community practitioners
- 3 Other universities

6 Primary Academic Disciplines

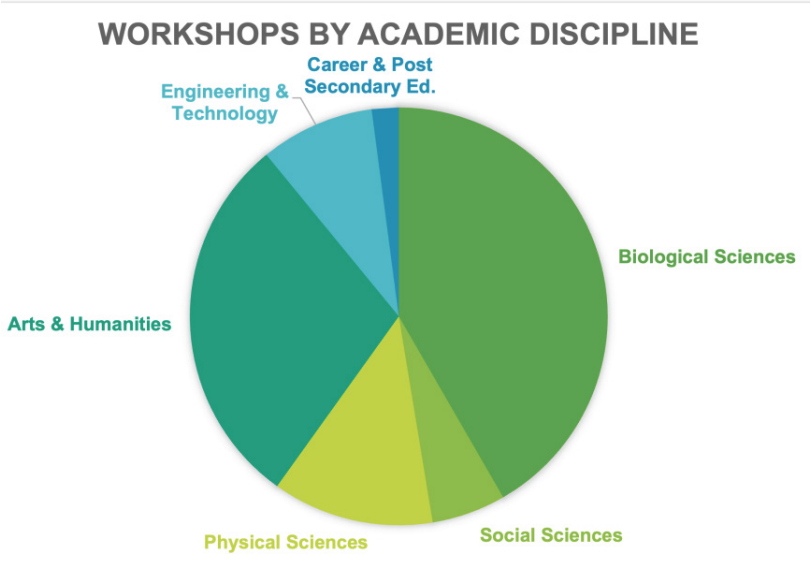


Figure 2. STEMCAP workshop breakdown by academic discipline

Workshop Topics/ Fields of Study

Within six primary academic disciplines, STEMCAP's workshop topics spanned 36 fields of study (*Fig 3.*) The three most common fields included Environmental Science, Visual Art, and Zoology. Some workshops fall into multiple categories and count toward the total number for both fields of study they engage with.

Topics by Discipline:											
Biological Sciences	**# of Workshops**	**Social Sciences**	**# of Workshops**	**Physical Sciences**	**# of Workshops**	**Arts & Humanities**	**# of Workshops**	**Engineering & Technology**	**# of Workshops**	**Career & Post Secondary Ed.**	**# of Workshops**
Environmental Science	49	Linguistics	1	Chemistry	2	Visual Art	49	Biomedical Engineering	1	College Prep.	4
Zoology	19	Public Policy	1	Electromagnetism	1	Writing	6	Computer Modeling	4		
Ecology	14	Research Ethics	1	Astrophysics	1			Bio-inspired Engineering	2		
Hydrology	1	Sociology	3	Atmospheric Sciences	1			Machine Learning	1		
Virology	1	Philosophy	1	Medicinal Chemistry	12			Chemical Engineering	4		
Microbiology	2	Anthropology	3	Geology	1			Engineering	1		
Molecular Biology	2	Psychology	1					Materials Engineering	3		
Neurobiology	1										
Conservation	1										
Neurology	2										
Biochemistry	1										
Mycology	1										

Figure 3. STEMCAP workshop breakdown by topic

Workshop Category Breakdown

Each STEMCAP workshop falls within three categories: *Mission STEMCAP*, *Conservation and Ecological Restoration Projects*, and *Topical Workshops.* See *Appendix A* for the distribution of workshops among centers and *Appendix B* for workshop summaries.

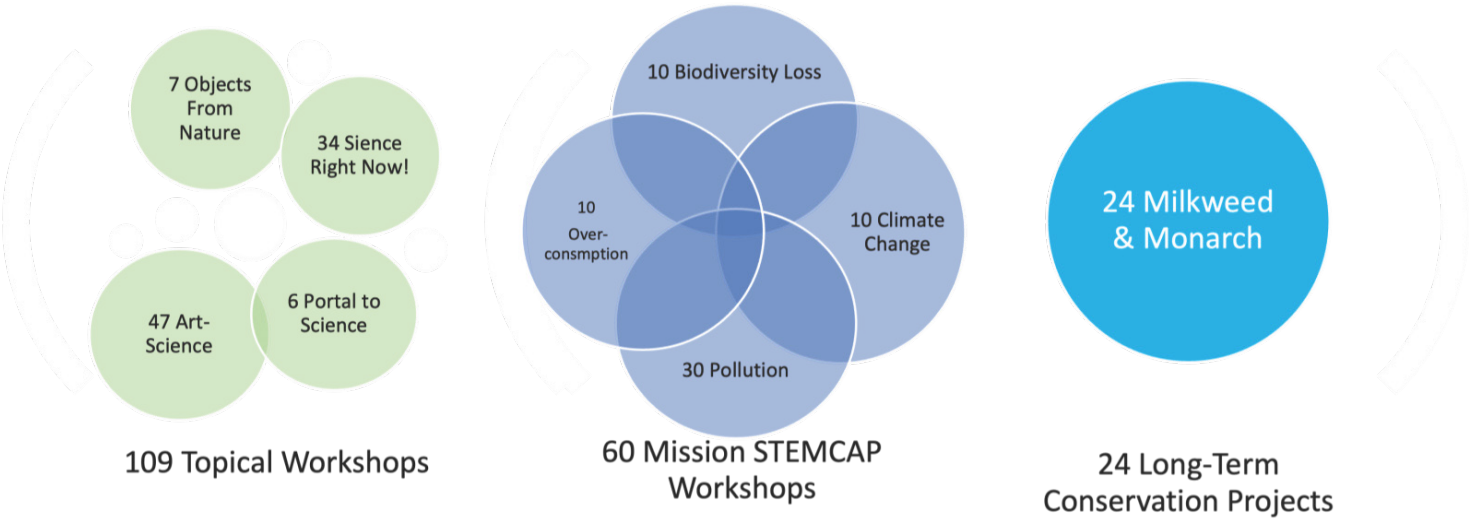


Figure 4. STEMCAP workshops by programming category

Description of Workshop Categories

Topical Workshops

1. *Science Right Now!* Workshops: Scientists share cutting-edge science and engage students with hands-on activities to build student confidence and excitement around science. [*Students Objectives: 1, 3, 5 & 6; Program Objectives: 1-3]*
2. *Portal to Science* Workshops: Connect University research scientists to YIC to introduce the scholarly, physical, and collaborative environment of academic labs and demystify lab work. Presenters demonstrate the range of skill levels and educational backgrounds in a lab group and help students understand the scope of career/life paths that lab work may lead to. [*Students Objectives: 1, 3, 5 & 6; Program Objectives: 1 & 3-5]*
3. *Objects from Nature* Workshops: Museum professionals and naturalists share objects from nature and natural history. Students practice observation techniques and are given the opportunity to directly handle natural objects while learning about the role of natural history in ongoing discovery, the role of nature in human life, and the role of observation in science. [*Student Objectives 1, 3, 5 & 6; Program Objectives 1, 3 -5*].
4. *Art-Science* Workshops: Provide opportunities for YIC students to learn and apply scientific principles and research in practical and creative ways. Linking together science and the arts teaches students different ways to communicate knowledge and reflect on experiences. Workshops result in art outcomes. [*Students Objectives: 1, 4 & 6; Program Objectives: 1, 2, 4 & 5].*
5. *STEM After High School* Workshops: Undergraduate students visit YIC facilities to share their experiences, including, the college application process, choosing a major, and the challenges and benefits of studying STEM. Presenters also provide information about other post-high school STEM pathways. [*Students Objectives: 1, 3, 5 & 6; Program Objectives: 1 & 3-5]*

Figure 5. Biodiversity of marine life collage from Mission STEMCAP: Biodiversity Loss

Mission STEMCAP

UU scientists, artists, and community partners facilitate activities centered around five "grand environmental challenges." Students engage with a particular challenge in various ways and focus on the role of collective action in problem-solving. The programming series aims to build student confidence in their abilities to become engaged in conservation and their communities. Students engaged in Mission STEMCAP at four centers this school year. The series spanned 8-10 consecutive school days. Activities include a documentary film discussion, a science presentation, an art-science workshop, creative writing, a virtual Utah Museum of Fine Arts (UMFA) tour, and a science communication workshop [*Student Objectives 1-6; Program Objectives 1 – 6 & 8*]. See *Appendix B* for an example series schedule.

Conservation Projects

Students become familiar with best practices in horticulture and can contribute to their community and the earth through the *Milkweed & Monarch Project.* In collaboration with the Utah Friends of Monarchs, YIC students participated in habitat restoration projects in the Salt Lake Valley by growing milkweed plants in the greenhouse or science classroom of their YIC center. Milkweed is critical for the Monarch butterflies' survival, providing them food and nesting sites. [*Student Objectives: 1-2 & 5-6; Program Objectives: 1, 3-6 & 8]*

Figure 6. Four-year-old Milkweed reared by YIC growing at Decker Lake Youth Center (above)

Figure 7. YIC planting milkweed seeds at Decker Lake Youth Center

STEMCAP's *We Are All Water* Exhibition

Beginning in 2022, YIC have contributed to a multi-site exhibition called *We Are All Water.* The exhibition focuses on water, identity, and community. It features YIC self-portraits alongside creative representations of the rivers that flow into the Great Salt Lake. In collaboration with the Center for Synthetic Organic Electrochemistry (CSOE) and the Utah Museum of Fine Art (UMFA), YIC create art pieces throughout a four-workshop series. Throughout the project, students learn 1) about the properties of water that enable all life on earth, 2) about water bodies in our Northern Utah communities, and 3) about threats to our waterways. Students reflect on water's role in their lives and how water (through the water cycle) connects us to all living things. In the 2022-23 fiscal year, seventy-three students participated in the *We Are All Water* project. The Day-Riverside branch of the Salt Lake City Public Library displayed the first exhibit featuring artwork by students in Day Skills Intervention (DSI), Gemstone, and Detention at Salt Lake Valley Youth Center (SLVYC). The Utah Cultural Celebration Center (UCCC) hosted the second showing of the exhibit. The UCCC show featured artwork by Decker Lake Youth Center (DLYC) students and included a digital display of the SLVYC students' portraits. In July, Mestizo Coffeehouse will feature pieces from DLYC and SLVYC alongside portraits by students at Farmington Bay Youth Center (FBYC). In August, the artwork from these three centers will be displayed on the walls of the Beverley Taylor Sorenson Arts & Education Complex on the University of Utah campus.

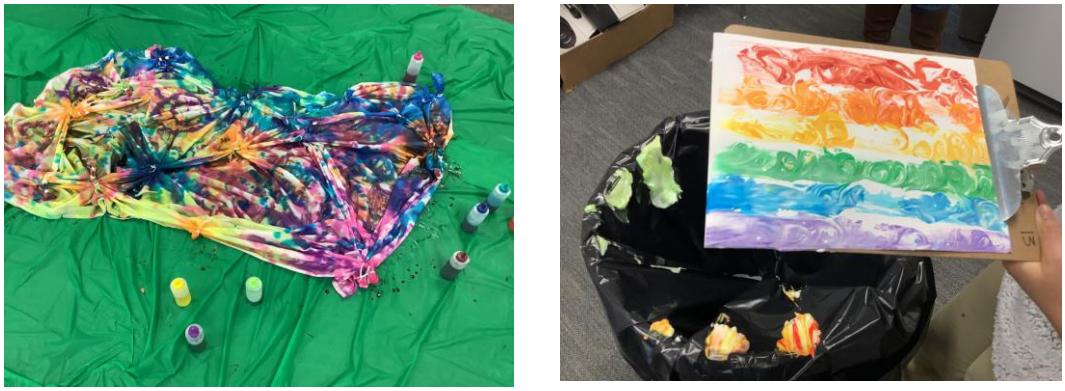


Figure 8. YIC create dyed representations of the Weber River for the We Are All Water project at FBYC (above)

Figure 9. Guests view YIC artwork at the UCCC's We Are All Water exhibit featuring DLYC artwork and digital versions of SLVYC pieces

Workshop Numbers & Programming Expansion

STEMCAP increased the types of programming and the amount of programming offered to YIC. In the 2021-2022 Fiscal Year, STEMCAP provided 125 workshops. This year (2022-2023), STEMCAP provided 181 workshops (*Fig. 10*), a 45% increase in total programs offered. STEMCAP also welcomed new presenters and formed new community partnerships. This year, the number of STEMCAP presenters rose by 65%, with 66 presenters providing STEMCAP workshops. While new presenters are getting involved in STEMCAP, previous presenters are also eager to continue engaging with YIC. Since 2016, 48% of presenters (*Fig. 12*) have returned to provide additional STEMCAP workshops to YIC.

Workshops in Years 2 & 3 of 5-Year Contract	Year 2: July 2021- June 2022	Year 3: July 2022- June 2023
Total # of Workshops	**125**	**181**
# of Unique speakers	40	66
# of workshops at DLYC	64	61
# of workshops at SLVYC	15	39
# of workshops at SCYC	6	11
# of workshops at MCYC	15	24
# of workshops at OSS	11	44
# of workshops at FBYC	14	24
Average number of YIC attendees per workshop	5	7

Figure 10. Workshop counts by center for Year 2 (July 1st, 2021- June 30th, 2022) and Year 3 (July 1st, 2022- June 30th, 2023)

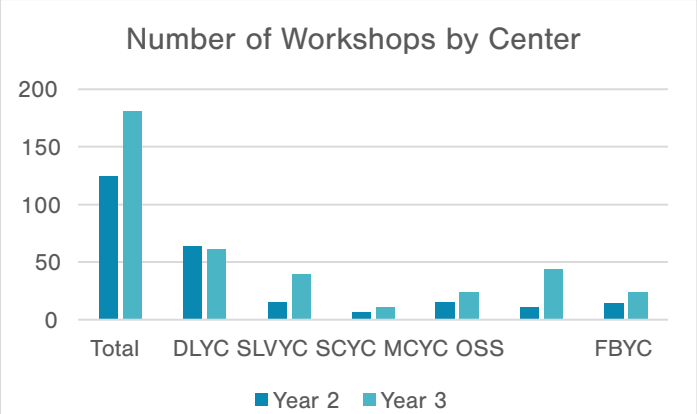


Figure 11. Workshop counts by center for Year 2 (July 1st, 2021- June 30th, 2022) and Year 3 (July 1st, 2022- June 30th, 2023)

Workshop Totals since 2016

Since its founding in 2016, STEMCAP has provided 503 workshops across eight YIC centers (*Fig. 12*). Workshops have focused on 69 different fields of study within seven primary disciplines: 1) biological sciences, 2) physical sciences, 3) social sciences, 4) arts & humanities, 5) Mathematics, 6) Engineering & Technology, and 7) career & post-secondary education.

Workshops since 2016	
Total Number of Workshops at DLYC	172
Total Number of Workshops at SLVYC	96
Total Number of Workshops at SCYC	25
Total Number of Workshops at FBYC	75
Total Number of Workshops at GTC	43
Total Number of Workshops at Wasatch	20
Total Number of Workshops at MCYC	39
Total Number of Workshops at OSS	33
Percent of speakers who presented more than once	47.93%
Total Number of Workshops	503
Total Number of Academic Disciplines	69

Figure 12. Workshop information and counts by center for all years (2016-2023)

Administrative Summary

Design and Implementation of STEMCAP Internship

STEMCAP partnered with the University of Utah College of Engineering (CoE) to pilot a summer research internship for one student at Decker Lake Youth Center, working with a CoE faculty member, Dr. Jacob Hochhalter. This summer internship aims to provide the student an opportunity to deepen his understanding of and passion for STEM. The YIC-intern focuses on an artificial intelligence assisted project. He is using ChatGPT – a computer program that uses artificial intelligence to communicate using natural language – to complete a research assessment examining the study habits of college students. ChatGPT uses its training and language processing abilities to generate an answer or response based on what it has learned when asked a question or given a prompt.

The intern will interact with ChatGPT over ten weeks to define and address an interesting, specific research question. The intern will record lab notes of each interaction, culminating in a final report to communicate discovered answers or other exciting information. Dr. Hochhalter and STEMCAP staff members will check in with the intern for one hour a week throughout the internship.

New STEMCAP Partnerships

STEMCAP formed new partnerships with three new organizations: Hollow Tree Honey Foundation, HawkWatch International, and Tree Utah. These partner organizations provided *Conservation* and *Objects from Nature* workshops to YIC. HawkWatch International brought live raptors to each of STEMCAP's partner YIC centers as part of their educational programming.

Pen Pal Program

The STEMCAP Pen Pal program began in 2021. Last year, six YIC students at Farmington Bay Youth Center wrote to University of Utah undergraduate students every other week as pen pals. This year, the program expanded to include Mill Creek Youth Center students, several of whom were paired with NASA scientists as their pen pals. First, the NASA scientists and undergraduate students introduced themselves in the first letter, and YIC chose which pen pal they felt was a good match for them. Students then used a prompt to introduce themselves and their academic and personal interests. Students at FBYC also participated in a collaborative art project with their pen pals. Each pair passed digital artwork back and forth, adding new elements to every letter they sent. See *Appendix D* for an example of a introduction letter written by one of our partners at NASA.

Evaluation & Data Collection

Inverness Research Inc.

The University of Utah's Institutional Review Board (IRB) has approved STEMCAP's research protocols. This year, STEMCAP collaborated with Inverness Research Inc. to formally evaluate STEMCAP programming and collect data for peer-reviewed research. Inverness Research Inc. helps education providers like STEMCAP to "articulate a project's theory of action, assess strengths and weaknesses of the design, and examine the extent to which and how the vision for the project matches implementation realities." STEMCAP hopes to use the data collected by Inverness Research Inc. to provide evidence-based practices to other institutions wishing to create STEMCAP-type programming in their states.

Inverness Research staff worked closely with STEMCAP staff to identify the program goals and objectives and develop ethical formal evaluation practices, including STEMCAP presenter surveys, YIC teacher surveys, presenter focus groups, individual presenter interviews, teacher focus groups, individual teacher interviews, and YIC administrator interviews. In July 2023, STEMCAP will review the outcomes of Inverness Research's evaluation report and use the data to adjust programming protocols and improve program implementation as appropriate.

Internal Evaluation

STEMCAP also collects informal evaluation data for internal program assessment in various ways. First, through reviewing students' worksheet responses following STEMCAP workshops. Second, by rating student engagement using a scale from 1-5 to indicate the number of questions asked, the number of students asking questions, the percentage of students answering questions, and the percentage of students making comments. This data helps STEMCAP find trends in student engagement across various topics and allows staff to offer new feedback to presenters based on student engagement levels. STEMCAP also uses art-based evaluation to assess students' main takeaways from art-science workshops, examine what aspects of workshops students reflect on most often or most profoundly, and get a the sense of students' perceptions of various STEM fields.

Dissemination of Work

On the Web

STEMCAP maintains a website (www.stemcap.org) to highlight the work of YIC students, scientists, artists, and community partners and to provide information about ways to get involved in the program. The website also hosts a virtual gallery of the *We Are All Water* exhibition. Staff regularly update the STEMCAP Instagram and Twitter accounts. Additionally, STEMCAP workshops have been featured on the Youth Educational Support School (YESS) blog (*Fig. 13*).

In the Media

STEMCAP's *We Are All Water* exhibition was featured in the Salt Lake Tribune. It was also included in the University of Utah newsletter *@TheU* and was distributed to university partners.

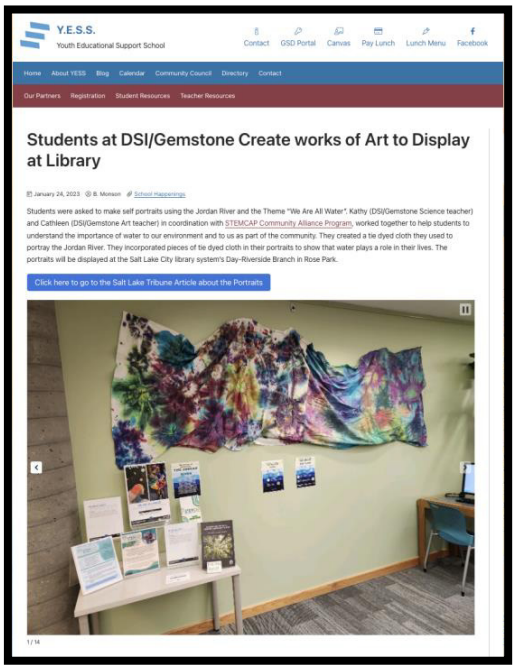


Figure 13. A YESS blog post about the We Are All Water project featuring SLVYC students' artwork at Day-Riverside Library.

Additional Dissemination

In partnership with CSOE and the STEM Ambassador program, STEMCAP presented at the Association of Science and Technology Centers (ASTC) virtual conference. With these same partners, STEMCAP staff co-authored a poster for the annual National Science Talk conference organized by the Association of Science Communicators.

Osher Lifelong Learning invited STEMCAP at the University of Utah to present a "Lunch & Learn" virtual lecture. Additionally, STEMCAP Associate Director Laura George and a seasoned STEMCAP presenter Dr. Rodolfo Probst presented on STEMCAP and the experience of working with YIC for the USBE's Check & Connect Webinar series.

Appendix A: Workshop Locations and Attendance

Presenter Affiliation	Workshop Title	# of Workshops	Total # in Attendance	Location(s)
UU	Art-Science: Graphic Medicine	3	14	Decker Lake Youth Center
UMFA	Art-Science: UMFA Virtual Tour, "Air" Exhibit	1	4	Farmington Bay Youth Center
UU	Science Right Now!: Medical Translation and Interpretation	1	10	Mill Creek Youth Center
UMFA	Art-Science: UMFA Virtual Tour, "Air" Exhibit	2	14	Slate Canyon Youth Center
UMFA	Art-Science: UMFA Virtual Tour, "Air" Exhibit	4	28	Oak Springs School
CSOE	Science Right Now!: Electrochemistry	1	4	Farmington Bay Youth Center
UU	Science Right Now!: Biomedical Engineering	1	4	Salt Lake Valley Youth Center
UU	Science Right Now!: Chem Engineering, Computer Modeling	1	10	Mill Creek Youth Center
UU	Mission STEMCAP (Overconsumption): Intro	1	11	Mill Creek Youth Center
UU	Mission STEMCAP (Overconsumption): Documentary Discussion	1	13	Mill Creek Youth Center
HawkWatch International	Objects from Nature: Raptors	1	5	Farmington Bay Youth Center
UU	STEM After High School: Different Higher Education paths	1	4	Salt Lake Valley Youth Center
UU, GPI	Mission STEMCAP (Overconsumption): Water Policy	1	8	Mill Creek Youth Center
UU	Conservation Workshop: Conservation Biology	3	17	Decker Lake Youth Center
UMFA, UU	Mission STEMCAP (Overconsumption): UMFA Virtual Tour Mission	1	6	Mill Creek Youth Center
UMFA, UU	STEMCAP (Overconsumption): Paper Making and Haiku Mission	1	8	Mill Creek Youth Center
UMFA, UU	STEMCAP (Overconsumption): Communication and Symposium	1	8	Mill Creek Youth Center

UMFA	UMFA Virtual Tour, "Air" Exhibit	1	6	Salt Lake Valley Youth Center
HawkWatch International	Objects from Nature: Raptors	2	40	Oak Springs School
HawkWatch International	Objects from Nature: Raptors	1	13	Slate Canyon Youth Center
STEMCAP	Art-Science: Intro to STEMCAP Art Exhibition, "We are all Water"	1	6	Slate Canyon Youth Center
UU	Conservation Workshop: Conservation Biology	1	4	Farmington Bay Youth Center
UU IRB	Science Right Now!: Research Ethics	1	7	Salt Lake Valley Youth Center
UU	Mission STEMCAP (Overconsumption): Hydrology	1	8	Mill Creek Youth Center
STEMCAP	Art-Science: Tie Dye and Paper Marbling for "We are all water"	2	10	Salt Lake Valley Youth Center
UU	Conservation Workshop: Urban Carnivores	1	7	Mill Creek Youth Center
STEMCAP	Art-Science: Portrait Making for "We are all Water" Part 1	2	12	Salt Lake Valley Youth Center
STEMCAP	Art-Science: Portrait Making for "We are all Water" Part 2	2	12	Salt Lake Valley Youth Center
UU	STEM After High School: Different Higher Education paths	1	6	Salt Lake Valley Youth Center
STEMCAP	Mission STEMCAP (Pollution): Intro	3	15	Decker Lake Youth Center
STEMCAP	Mission STEMCAP (Pollution): Documentary	3	17	Decker Lake Youth Center
STEMCAP	Mission STEMCAP (Pollution): Documentary Discussion Part 2	3	17	Decker Lake Youth Center
UU	Mission STEMCAP (Pollution): Light and Sound Pollution	3	15	Decker Lake Youth Center
UMFA	Mission STEMCAP (Pollution): UMFA Virtual Tour	3	17	Decker Lake Youth Center
UU	Mission STEMCAP (Pollution): Pollution Zine	3	17	Decker Lake Youth Center

Duke University	Portal to Science: MD/Ph.D. Virology Lab Tour	1	5	Farmington Bay Youth Center
UU	Mission STEMCAP (Pollution): Environmental (In)justice	3	15	Decker Lake Youth Center
UU	Objects from Nature: Bio-Inspired Freeze Casting	1	6	Salt Lake Valley Youth Center
UU	Mission STEMCAP (Pollution): Poetry	3	17	Decker Lake Youth Center
STEMCAP	Mission STEMCAP (Pollution): Symposium	3	16	Decker Lake Youth Center
UU	Science Right Now!: Machine Learning	1	5	Salt Lake Valley Youth Center
UU	Science Right Now!: Chem Engineering, Computer Modeling	3	13	Decker Lake Youth Center
UU	Portal to Science: Chemical Engineering	1	11	Mill Creek Youth Center
UU	Objects from Nature: Insects	1	13	Slate Canyon Youth Center
UU	Objects from Nature: Insects	4	20	Oak Springs School
STEMCAP	Art-Science: Intro to STEMCAP Art Exhibition, "We are all Water"	3	15	Decker Lake Youth Center
UU	Conservation Workshop: Conservation Biology	1	7	Mill Creek Youth Center
UU	Science Right Now!: Chemical Engineering	3	30	Mill Creek Youth Center
UU	Science Right Now!: Electromagnetism	1	5	Salt Lake Valley Youth Center
STEMCAP, UMFA	Art-Science: "We are all water" Portraits Day 1	3	27	Decker Lake Youth Center
UU	Science Right Now!: Astrophysics	1	5	Farmington Bay Youth Center
STEMCAP, UMFA	Art-Science: "We are all water" Portraits Day 2	1	28	Decker Lake Youth Center
UU	Conservation Workshop: Bears	1	5	Farmington Bay Youth Center

UU	Science Right Now!: Electrical and Computer Engineering	1	6	Salt Lake Valley Youth Center
NHMU	Science Right Now!: Trees and Climate	2	10	Farmington Bay Youth Center
UU	Science Right Now!: Materials Engineering (Heat)	3	17	Decker Lake Youth Center
STEMCAP, UMFA	Art-Science: "We are all water" Statements	3	16	Decker Lake Youth Center
STEMCAP	Mission STEMCAP (Climate Change): Intro	1	4	Farmington Bay Youth Center
UU	Objects from Nature: Fishes in the Field	1	6	Mill Creek Youth Center
STEMCAP	Mission STEMCAP (Climate Change): Doc Discussion	1	6	Farmington Bay Youth Center
UMFA	Mission STEMCAP (Climate Change): UMFA Virtual Museum Tour	1	6	Farmington Bay Youth Center
UMFA	Mission STEMCAP (Climate Change): UMFA Art-Science Workshop	1	6	Farmington Bay Youth Center
UU	Mission STEMCAP (Climate Change): Using Maps to Study Climate Change	1	6	Farmington Bay Youth Center
STEMCAP	Mission STEMCAP (Climate Change): Poetry Writing	1	6	Farmington Bay Youth Center
STEMCAP	Mission STEMCAP (Climate Change): We Are All Water/ Utah Water Issues Part 1	1	6	Farmington Bay Youth Center
STEMCAP	Mission STEMCAP (Climate Change): We Are All Water/ Utah Water Issues Part 2	1	6	Farmington Bay Youth Center
UU	Mission STEMCAP (Climate Change): Atmospheric Science	1	6	Farmington Bay Youth Center
UU	Objects from Nature: Bio-Inspired Freeze Casting	1	9	Mill Creek Youth Center
STEMCAP	Mission STEMCAP (Biodiversity Loss): Intro	1	3	Salt Lake Valley Youth Center
UU	Mission STEMCAP (Biodiversity Loss): Urban Biodiversity Mission	2	6	Salt Lake Valley Youth Center
UU	STEMCAP (Biodiversity Loss): Careers in Conservation	2	6	Salt Lake Valley Youth Center
UMFA	Mission STEMCAP (Biodiversity Loss): UMFA Virtual Museum Tour	2	7	Salt Lake Valley Youth Center

HawkWatch International	Objects from Nature: Raptors	2	12	Decker Lake Youth Center
STEMCAP	Mission STEMCAP (Biodiversity Loss): Science Right Now!: Forest Canopies	2	7	Salt Lake Valley Youth Center
STEMCAP	Mission STEMCAP (Biodiversity Loss): Poetry Writing	2	6	Salt Lake Valley Youth Center
UU	Mission STEMCAP (Biodiversity Loss): Science Right Now!: Great Salt Lake	2	6	Salt Lake Valley Youth Center
UU, UMFA	Mission STEMCAP (Biodiversity Loss): Art/ Science: Biodiversity of Fish	2	5	Salt Lake Valley Youth Center
STEMCAP	Mission STEMCAP (Biodiversity Loss): Symposium	2	5	Salt Lake Valley Youth Center
UU	Portal to Science: Microbiology	1	5	Farmington Bay Youth Center
STEMCAP, UMFA	Art-Science: "We are all water" Portraits Day 1	1	6	Farmington Bay Youth Center
UU	Science Right Now!: Brain Science and Philosophy	1	3	Salt Lake Valley Youth Center
UU	Science Right Now!: Using Flies to study the behavior	1	8	Mill Creek Youth Center
UU	Art-Science: Light from the Sun	2	14	Slate Canyon Youth Center
UU	Art-Science: Light from the Sun	4	20	Oak Springs
UU	Conservation Workshop: Mammal Conservation	1	6	Farmington Bay Youth Center
STEMCAP, Utah Friends of Monarchs	Conservation Project: Introduction to Milkweed and Monarch Project	1	9	Mill Creek Youth Center
STEMCAP	Art-Science: We Are All Water: Tie-dye, paper marbling	1	6	Farmington Bay Youth Center
STEMCAP, Utah Friends of Monarchs	Conservation Project: Introduction to Milkweed and Monarch Project	1	21	Decker Lake Youth Center
UU	Science Right Now!: Traditional Ecological Knowledge	3	18	Decker Lake Youth Center
UU	Science Right Now!: Psychology: Clinical	1	6	Farmington Bay Youth Center

	Psychology and Neurological Research			
UVU	Objects from Nature: Geology	1	2	Salt Lake Valley Youth Center
STEMCAP, UMFA	Art-Science: We Are All Water: Portraits Part 2	1	6	Farmington Bay Youth Center
UU, Hollow Tree Honey Foundation	Conservation Workshop: Entomology Milkweed and Monarch Project	1	19	Decker Lake Youth Center
UU	Science Right Now!: Psychology: Neurological Research	1	9	Mill Creek Youth Center
UU	Science Right Now!: Biochemistry	1	2	Salt Lake Valley Youth Center
UU	Portal to Science: Medicinal Chemistry	2	15	Slate Canyon Youth Center
UU	Portal to Science: Medicinal Chemistry	4	30	Oak Springs School
Hollow Tree Honey Foundation	Conservation Project: Native Pollinators Milkweed and Monarch Project	1	22	Decker Lake Youth Center
Independent	Objects from Nature: Mycology	1	4	Salt Lake Valley Youth Center
UU	Conservation Project: Entomology Milkweed and Monarch Project	1	9	Mill Creek Youth Center
UU	Conservation Workshop: Camera Trap Project	1	3	Salt Lake Valley Youth Center
UU	Conservation Project: Careers in Conservation	1	21	Decker Lake Youth Center
UVU	Objects from Nature: Microplastics	1	10	Mill Creek Youth Center
HawkWatch International	Objects from Nature: Raptors	1	3	Salt Lake Valley Youth Center
UC Berkley	Portal to Science: Diseases in Bees	1	3	Salt Lake Valley Youth Center
Hollow Tree Honey Foundation	Conservation Project: Overview of Utah Pollinators, Seed Balls	1	10	Mill Creek Youth Center
Hollow Tree Honey Foundation	Conservation Project: Overview of Utah Pollinators, Seed Balls	1	28	Decker Lake Youth Center

CSOE	Electrochemistry: Hydrolysis and Batteries	2	18	Slate Canyon Youth Center
CSOE	Electrochemistry: Hydrolysis and Batteries	4	25	Oak Springs School
STEMCAP	Conservation Project: Milkweed Out Planting	1	11	Mill Creek Youth Center
UMFA	Art-Science: Entropy Painting	1	5	Farmington Bay Youth Center
NHMU	Objects from Nature: Scientific Drawing Invertebrates	1	6	Farmington Bay Youth Center
Totals	183 Workshops		Average YIC: 7 Total YIC: 1202	6 Locations

Appendix B: Example Mission STEMCAP Schedule

Day 1: Frame the Challenge
March 8th - 9:25 to 10:35 am,10:45 to 11:55 am, 1:00 to 2:10 pm
STEMCAP staff introduce the center's grand challenge of overconsumption and explain the activities they will be doing over the next two weeks.

Session Outcomes: Students and teachers will be prepared to participate actively in Mission STEMCAP.

Day 2-3: Documentary Series Discussion – A Life on Our Planet
March 9th - 9:25 to 10:35 am, 10:45 to 11:55 am, 1:00 to 2:10 pm
YIC watch a documentary film related to the challenge of overconsumption. STEMCAP staff lead students through a discussion of the film and how it communicated overconsumption issues.

Session Outcomes: Students will have a broad understanding of the concept of overconsumption and how it affects wildlife and humans, and how documentary films can educate and motivate public action.

Day 4: Science Right Now!
March 10th - 9:25 to 10:35 am, 10:45 to 11:55 am, 1:00 to 2:10 pm
A scientist delivers an in-depth presentation about the cutting-edge research behind microplastics in Utah water, air, and soil. She relates the issue of plastic pollution to the grand challenge of overconsumption and how it affects ecosystems and human health in our own backyard.

Session Outcomes: Students will understand the obstacles humans, wildlife, and overall ecosystems face because of the overconsumption of plastic products.

Day 5: Art-Science Workshop- Consumption of Resources
March 11th - 9:25 to 10:35 am, 10:45 to 11:55 am, 1:00 to 2:10 pm
Art educators from the Utah Museum of Fine Art lead students through a hands-on art workshop on overconsumption in the Salt Lake Valley. Students create upcycled visual art pieces that express elements of overconsumption.

Session Outcomes: students will understand and be able to demonstrate how artistic expression can contribute to understanding a scientific issue and contribute to efforts to reduce consumption.

Day 6: Art-Science Workshop- Creative Writing
March 15th - 9:25 to 10:35 am, 10:45 to 11:55 am, 1:00 to 2:10 pm
After studying the challenges of overconsumption with the STEMCAP presenters, students learn how to write haikus and express their observations of nature through this traditional Japanese poetry form. Students explore the power of haiku to awaken and express the human connection to nature and then write a haiku about the adverse effects of overconsumption.

Session outcomes: The haiku of all group members will be combined into one poem expressing the group's reflections on the impact of overconsumption on their lives and the life of our planet. Students will be able to identify syllables, write haikus and use imagery to reflect on threats to the natural world.

Day 7: UMFA Virtual Museum Tour
March 16th - 9:25 to 10:35 am, 10:45 to 11:55 am, 1:00 to 2:10 pm
Staff from the UMFA take YIC on a virtual tour of the UMFA curated around the theme of overconsumption – how it is represented in art within the museum – and discuss the museum's efforts to build exhibits around social and environmental issues such as overconsumption. Students think about how this educational space might reach a different audience than a public science lecture. Students work on a hands-on project thinking about how they might curate an art exhibit at the UMFA that highlights Utah's overconsumption issues.

Session outcomes: Students will understand the potential impact museums can have when spreading the word about overconsumption and other issues that their communities may face and will get a chance to visit the art museum virtually.

Day 7: CorRESPONDence- Overconsumption Conversation Workshop
March 17th - 9:25 to 10:35 am, 10:45 to 11:55 am, 1:00 to 2:10 pm
STEMCAP staff guide students through a review and reflection of what they've learned and what actions are being taken to curb overconsumption, such as participating in scientific research and raising awareness through writing and art will. YIC discuss the importance of community education as a tool for inspiring social and environmental change before completing a worksheet and writing messages to share with others about overconsumption. YIC's messages are shared with a group of undergraduate students at the University of Utah who share their own messages with the YIC.

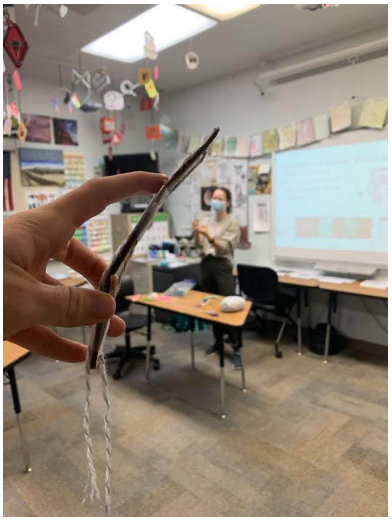
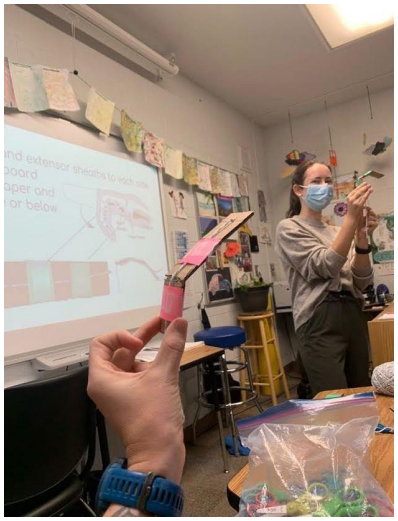
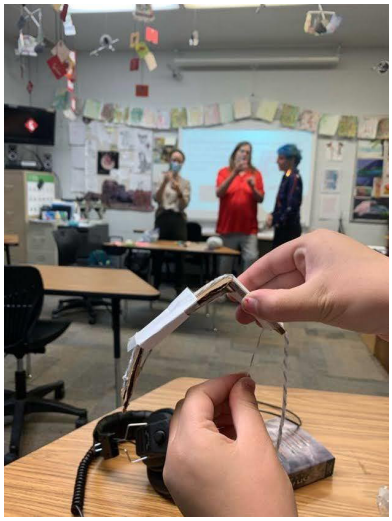
Session outcomes: Students will share what they have learned, why it is important to them, and how people can help tackle the challenge. They will also understand the potential impact of spreading the word about overconsumption and other issues that their communities may face.

Day 8: Symposium
March 18th - 9:25 to 10:35 am, 10:45 to 11:55 am, 1:00 to 2:10 pm
Students can share what they have learned and show off their artwork and poems. STEMCAP staff also deliver a short synthesis presentation designed to reiterate all their work toward addressing the Grand Challenges and provide pathways to use these concepts to solve problems of all kinds.

Session Outcomes: Students can share their work reflect on Mission STEMCAP.

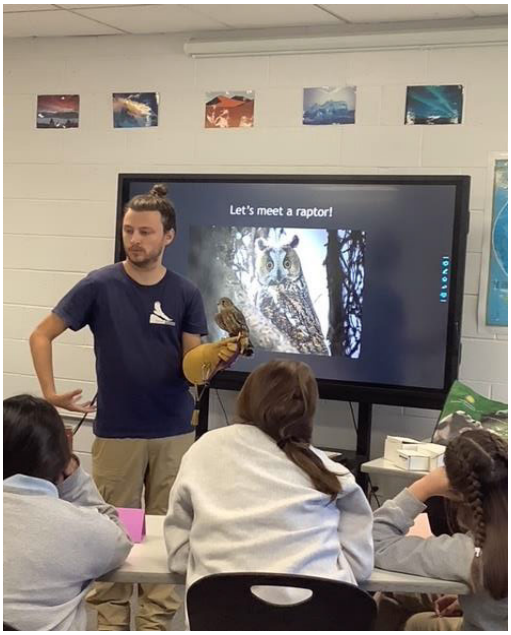
Appendix C: Workshop Photographs & YIC Work

September 21, 2022 – Science Right Now!: Biomedical Engineering

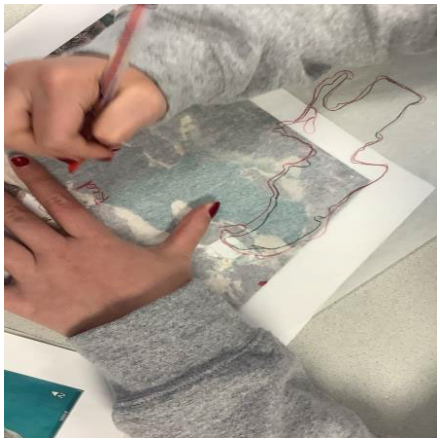




Students creating articulated human joint models

October 4, 2022 – Objects from Nature: HawkWatch International Raptors Presentation

February 14, 2023 – Mission STEMCAP – Climate Change



Students using aerial maps to study changes in bodies of water over time

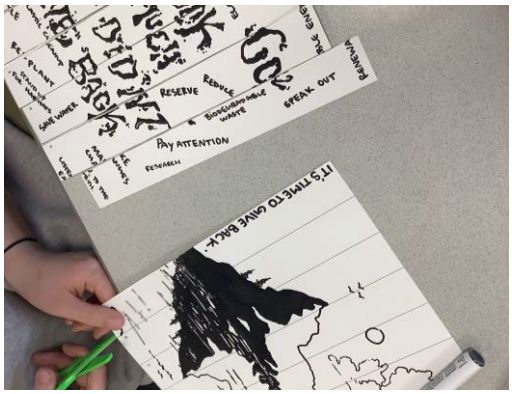
March 22, 2023 – Art-Science: Light Chemistry

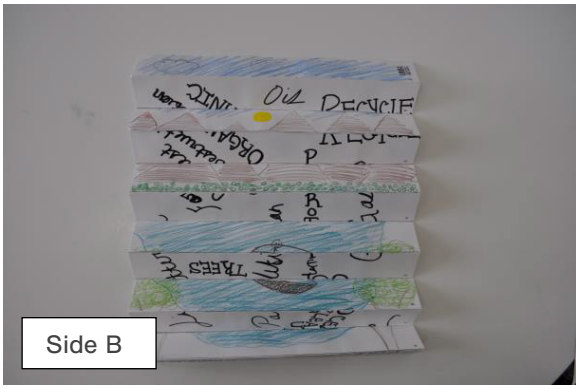
Students using fluorescent paint to create a painting

March 9,2023 – Mission STEMCAP – Biodiversity Loss

Students creating a coral reef collage

February 10, 2023 – Mission STEMCAP – Climate Change





Photos above show students making agamographs with UMFA

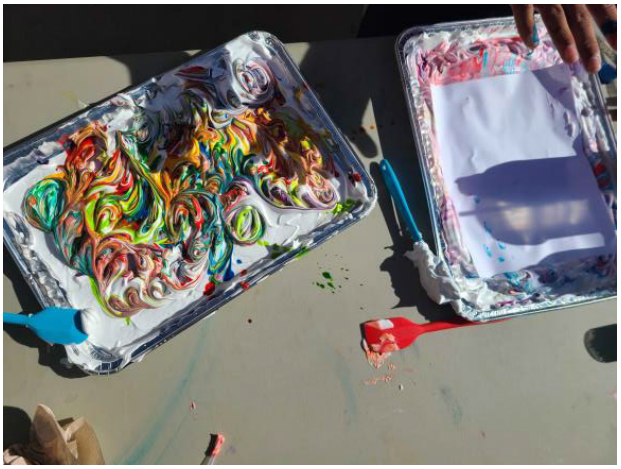
February 2, 2023 – Objects from Nature: Evolution and Diversity of Fish

Students sort fish by morphology

February 6, 2023 – Mission STEMCAP – Climate Change: Introduction to Climate Change

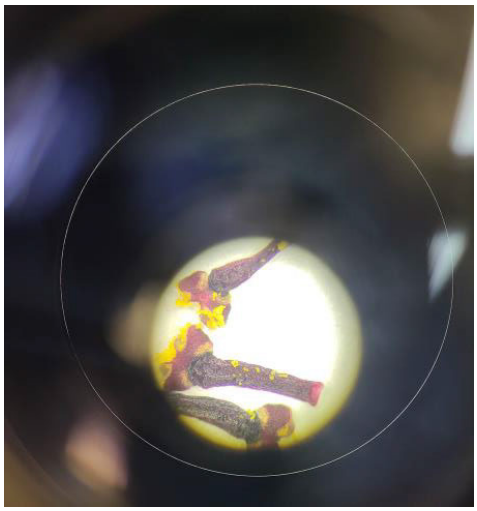
Students observing the greenhouse effect

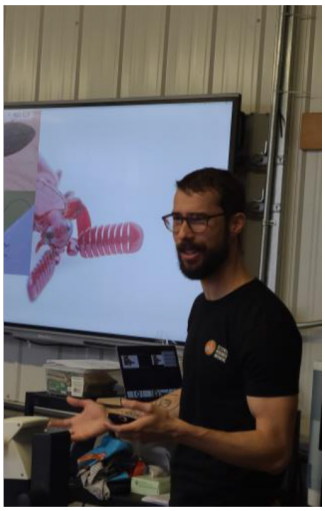
March 30, 2023 – We Are All Water: Tie-Dye and Paper Marbling



October 26, 2022 – We Are All Water: Portrait Making

December 7-8, 2022 – Science Right Now!: Entomology



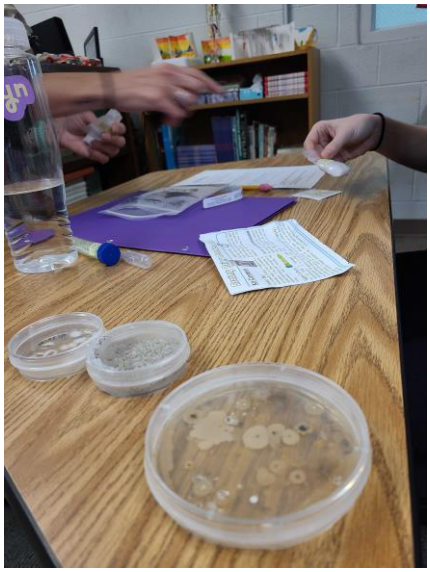


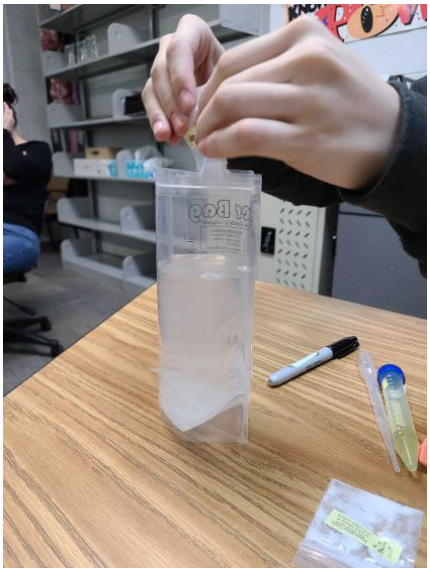
April 26, 2023 – Art-Science: Mycology Workshop

The students grew oyster mushrooms in milk cartons

September 13, 2022 – Science Right Now!: Medical Translation and Interpretation

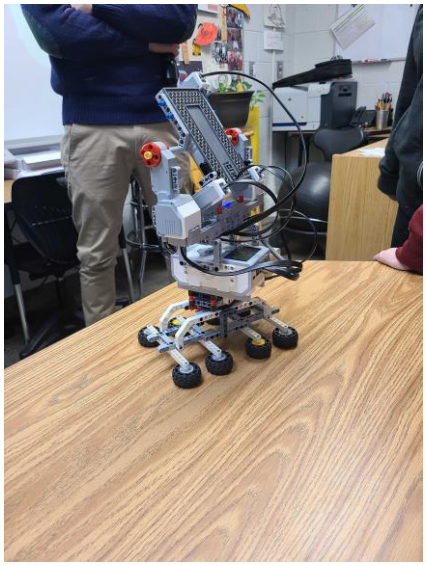
March 8, 2023 – Mission STEMCAP Biodiversity Loss, Great Salt Lake Workshop

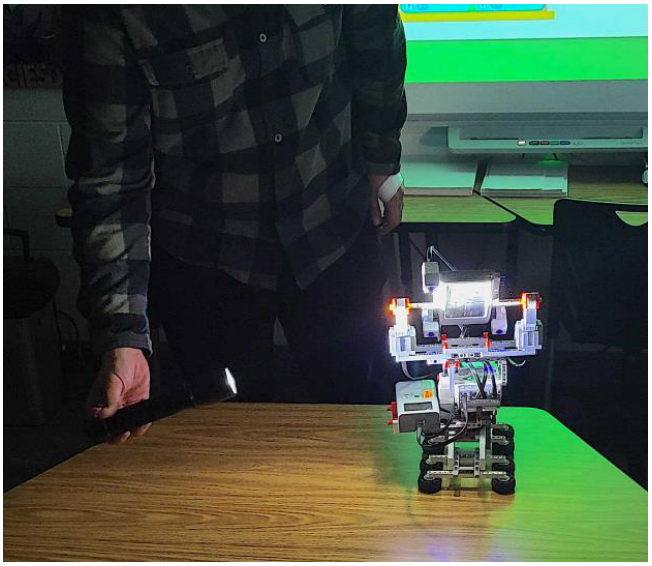




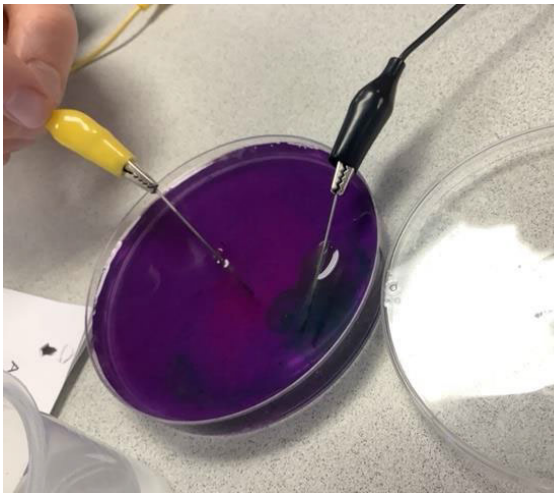
The students prepare ideal environments for brine shrimp to grow in

February 1, 2023 – Science Right Now!: Electrical and Computer Engineering



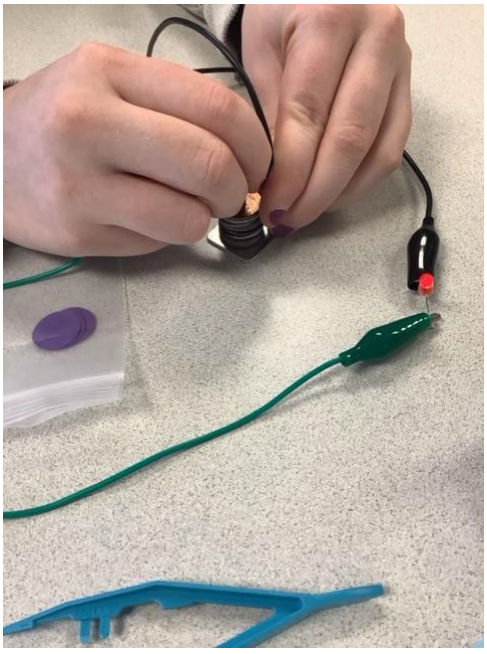


September 20, 2022 – Science Right Now!: Electrochemistry Workshop



Students work on a hydrolysis project

September 20, 2022 – Science Right Now!: Electrochemistry Workshop



Students building batteries

Appendix D: Introduction Letter from NASA Pen Pal

Hi, I am JME. I am a mechanical engineer and research scientist at one of the US DOE National Laboratories. In my job, I work to develop computer modeling and simulation to predict how structures will fail. Structures fail lots of ways, but my focus is on fracture. What I find most fascinating about it is the details of the materials microstructure – what you see if you look at the material with a powerful microscope – completely matter, even for really big structures like bridges or buildings. So, even though you might use feet (or meters) to measure the height of the building, the stuff you would use tiny fractions of inches (or microns!) plays a very important role. It has led me to realize that all of our natural and manmade surroundings have layers of length (and time) scale that are important. And, it makes me realize that, even though I'm one small part of a large, world-wide community of people investigating this type of phenomena, my tiny contributions are important and add to the collective body of work. So, I guess, we all have a role to play.

All that said, like any job, I have to make an effort to focus on work because I have lots of hobbies. I love fishing, and hiking in the mountains. I love skiing, and just being outdoors as much as possible. I recently started playing in a men's +45 wooden-bat baseball league. I'm a catcher. I have also been trying to teach myself how to make things out of wood. Humbling!

I am excited for the opportunity to write to you because I know that everyone has a story and a contribution to make, if even small in the grand scheme. I'd like to get to know you and understand your story, and I hope that maybe sharing my story will encourage you in your quest to learn. Knowledge is power (I tell myself), and it can be very exciting. I also know, from my personal experience, that learning can be frustrating and intimidating. Usually, the biggest barrier to learning, for me, is my own inner voice telling me "you're not smart enough". But I've found that, when I am most determined and positive, I can learn almost anything by taking small bites. And that determination is very rewarding.

Anyway, I look forward to getting to know you.