



UW TOP-TIER
SCIENCE
INITIATIVE

University of Wisconsin

2021-22

ANNUAL REPORT

REVOLUTIONIZING SCIENTIFIC EDUCATION AND DISCOVERY IN WYOMING

The University of Wyoming's Science Initiative enables world-class research and education that will strengthen the foundations of Wyoming's present and future economy. Through integrated, interdisciplinary science, Wyoming's current and future researchers and entrepreneurs will revolutionize areas of Wyoming's economy including mineral extraction, agriculture, tourism, resource management, and emerging technology, while also preserving Wyoming's greatest natural resources and unique biodiversity. The Science Initiative will provide UW students with a flexible, pioneering skill set, giving them the resources to invent a Wyoming future whose details cannot be fully known.

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WHO WE ARE

Mark Lyford, Executive Program Director, UW Science Initiative; Senior Academic Professional, Lecturer, Botany

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Jamie Crait, Director, Wyoming Research Scholars Program; Assistant Academic Professional, Lecturer, Botany

Karagh Brummond, Director, Engagement and Outreach; Instructional Professor, Honors College

Tabatha Spencer, Executive Business Manager, UW Science Initiative

Ryan Goeken, Information Specialist, Sr., UW Science Initiative

LETTER FROM THE DIRECTOR

Dear Friends of the Science Initiative,

2021-2022 marked another monumental year for the Science Initiative. Our programs continue to expand transformational experiences for faculty and students not only at UW, but at our community colleges and throughout Wyoming's K-12 system. Perhaps most notable was the Spring 2022 grand opening of the new Science Initiative Building, with a ribbon cutting ceremony on March 24 followed by the gradual move-in of nearly 125 faculty, staff and students. Great things are happening in the SI!

The Science Initiative Building, an amazing, state-of-the-art facility, will create new and exciting opportunities for our faculty and students, and will pave the way for how the University of Wyoming supports the state through teaching, research and service in the coming decades. The building houses a 204-seat active learning classroom which will provide appropriate space for instructors to engage students in their own learning, particularly in our large introductory classes, as data clearly demonstrates students engaged through active learning are far more successful in their courses. Extensive, open and shared research laboratories will support collaborative, cross-disciplinary research of faculty from across 5 departments. This facility, known as the Center for Integrated Biological Research (CIBR), is an evolutionary step for advancing the research mission at UW. Researchers within the building and from across campus will also benefit from several modern support facilities. The Center for Advanced Scientific Instrumentation (CASI) will provide cutting-edge, high-cost instruments to support research endeavors for a much broader set of faculty, thereby increasing campus efficiency and broadening research opportunities for hundreds of faculty and students. Similarly, the roof of the Science Initiative Building is covered in modern greenhouses to support research in plant biology that was not possible before. The current approved plans also include three shelled spaces yet to be completed. The first floor will provide additional innovative space for research expansion as well as a Model Organism Research Facility (MORF) to provide modern care facilities for research organisms. Finally, the fourth floor will house a one-of-a-kind space for the Student Collaborative Research, Outreach and Learning Laboratory (SCROLL), which will offer transformational space to support students, staff and faculty engaged in the work of the Science Initiative Programs.

While the programs of the Science Initiative will clearly benefit from the new building, their reach continues to extend across campus and throughout the state. Students taught by faculty and undergraduate learning assistants who have been trained through the Learning Actively Mentoring Program (LAMP) benefit from the engaging learning opportunities offered in their courses. Our undergraduates and faculty mentors continue to thrive through the intensive research experiences supported by the Wyoming Research Scholars Program. Hundreds of students, teachers and community members were touched by the hands-on learning opportunities offered by the K-Community Roadshow. The amazing reach and impact of these programs is outlined in detail in the following pages.

I hope you find the opening of the new building and the accomplishments of our students, faculty and staff as exciting and rewarding as I do. This past year was fantastic, and the future looks even more promising for how the Science Initiative will serve UW and Wyoming. Enjoy the great information that follows, and if you ever have questions or are in town and want a tour of the building, please don't hesitate to reach out.

Best Regards,

Mark E. Lyford
Executive Director, Science Initiative Programs

GIVE TO THE SCIENCE INITIATIVE

HELP SUPPORT STUDENT SUCCESS IN THE CLASSROOM, IN THE LABORATORY, AND AROUND THE STATE:

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ENGAGEMENT



The SI Roadshow brought active learning to

838

K-12 students during

21

outreach and inreach events in schools and other venues

The SI Roadshow secured

\$5,000

in grant funding from external industry and foundation partners to bring active learning to K-12 students across the state



Karagh Brummond, Director of SI Engagement & Outreach, was accepted as one of 9 new Teen Science Café fellows, funded by the NSF. The Teen Science Café programs are a free, fun way for local teens to engage in STEM. Brummond, along with other UW faculty and UW students facilitated

5

STEM experiences over the spring semester of 2022.

WYOMING RESEARCH SCHOLARS PROGRAM (WRSP)

WRSP included 53 scholars from 13 US states and 2 countries



31

WY scholars from

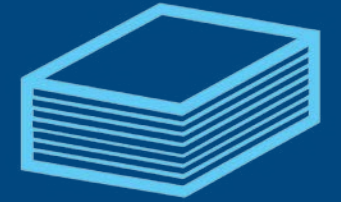
10

WY counties

WRSP scholars did

13,089

hours of research



WRSP scholars contributed to

10

articles published (or to-be-published) in peer-reviewed journals

In a final evaluation survey for graduating students, on average, WRSP scholars reported a

GREAT GAIN

in confidence in ability to do research and contribute to science

"I am so happy I chose UW as my college... I don't think I would have been able to participate in this level of research as an undergrad anywhere else. Additionally, because of all that experience, I got into grad school, and I can continue my career in STEM."

LEARNING ACTIVELY MENTORING PROGRAM (LAMP)

LAMP Fellow Danny Dale was named the **WYO-Gold Teacher of the Year**.

2 Professors

named "Top Prof" by Mortar Board Seniors were LAMP Fellows - Kerry Sondgeroth and Ginka Kubelka.

LAMP-trained professors taught

4,071

students in UW active learning courses



The LAMP Fellows program trained

34

instructors from

5

WY institutions (and 2 other entities)

LAMP Director Rachel Watson serves as the PI for Wyoming's Howard Hughes Medical Institute's Inclusive Excellence Challenge (the HHMI IE3). The Wyoming team is one of 15 groups from across the country that form a nationwide learning community re-envisioning inclusive collaborations between 2-year and 4-year institutions. Rachel also leads community building sessions for the entire national cohort. The national cohort will soon receive **\$8M** to be distributed amongst teams to continue their work.

OTHER HIGHLIGHTS

The **Science Initiative building** was completed and a ribbon-cutting ceremony was held on March 24, 2022. The building includes 5 core research & educational facilities, including a 200-seat Active Learning Classroom (ALC), the Center for Advanced Scientific Instrumentation (CASI), the Center for Integrative Biological Research (CIBR), rooftop greenhouses and walk-in growth chambers, and the Student Collaborative Research, Outreach & Learning Laboratory (SCROLL).



In May of 2022, the SI Roadshow facilitated a 3-day field research experience at Curt Gowdy State Park for 5th graders from Snowy Range Academy (SRA) in Laramie. Students carried out their own field research projects and presented the results to parents, students, and teachers at SRA. This marks the second year of the Roadshow's collaboration with SRA on this project.



17

UW students gained research experience in the third year of Course-based Undergraduate Research Experiences (CURE)

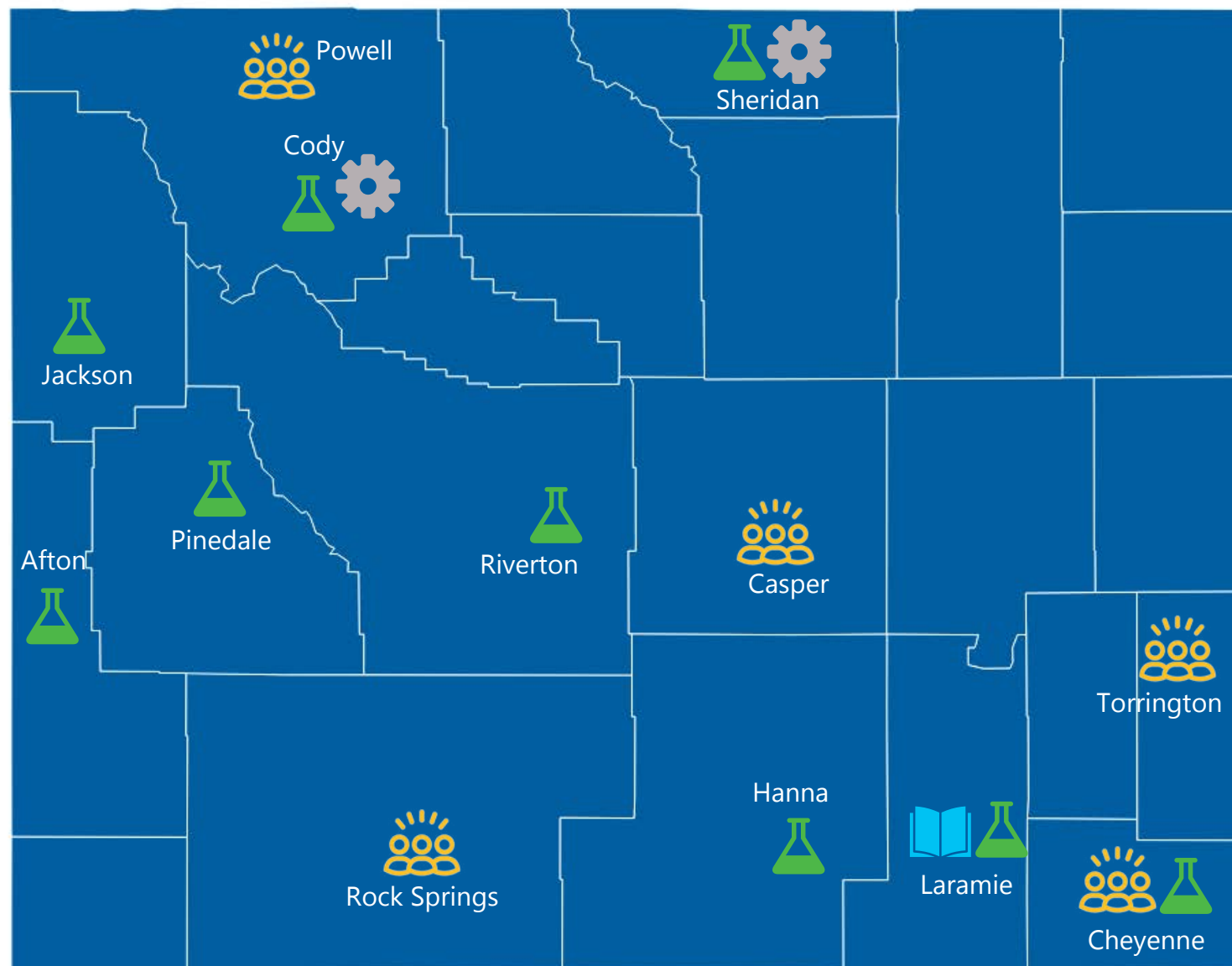
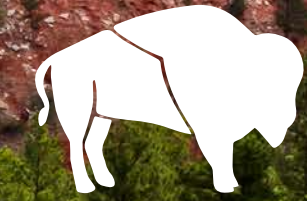
STATEWIDE ENGAGEMENT (2021/2022)



THE SCIENCE INITIATIVE
REACHED

13

DIFFERENT WYOMING
COMMUNITIES



SCIENCE INITIATIVE ROADSHOW - Bringing active learning to K-12 classrooms

6/17/21 - Laramie Rec Center Afterschool
6/28/21 - Jackson - Teton Literacy School
7/26/21 - Laramie Rec Center Afterschool
8/9/21 - Laramie Rec Center Afterschool
10/15/21 - Hanna - HEM Jr/Sr High
12/1/21 - Pinedale - Skyline Academy
2/17/22 - Sheridan YMCA Afterschool
3/1/22 - Riverton Middle School
3/3/22 - Cody Middle School
3/9/22 - Cheyenne Central High School

3/29/22 - Laramie High School
4/2/22 - Laramie - Teen Science Café
4/9/22 - Laramie - Teen Science Café
4/16/22 - Laramie - Teen Science Café
4/21/22 - Laramie High School
4/29/22 - Afton (Inreach) - Star Valley HS
4/30/22 - Laramie - Teen Science Café
5/2/22 - Pinedale - Skyline Academy
5/18/22 - Laramie - Snowy Range Academy
5/21/22 - Laramie - Teen Science Café



SERVICE CLUB VISITS - Bringing SI stories to Rotary clubs

2/17/22 - Sheridan Rotary

3/3/22 - Cody Rotary



COMMUNITY COLLEGE HHMI VISITS - LAMP collaborating with community colleges to support and create Educator's Learning Communities

1/24/22 - Powell - Northwest College
2/4/22 - Torrington - Eastern WY College
3/30/22 - Cheyenne - LCCC

4/15/22 - Cheyenne - LCCC
4/28/22 - Rock Springs - Western WY CC
5/3/22 - Casper - Casper College



OTHER EVENTS

4/28/22 - Laramie - Inreach for Chadron State College Upward Bound Students - active learning experiences
5/17/22 - Laramie - Women in STEM Conference - active learning experiences for Wyoming high school students

OPENING THE SCIENCE INITIATIVE BUILDING

In March of 2022, the Science Initiative Building was officially opened with a ribbon-cutting ceremony. Speakers included Former Wyoming Governor Dave Freudenthal, UW President Ed Seidel, and Science Initiative Executive Directors Mark Lyford and Greg Brown. Over the spring and summer of 2022, final work and furnishings were finished and faculty and staff completed office and laboratory move-ins, with a full opening of the building taking place in Fall 2022.

THE BUILDING AT A GLANCE

153,000
SQ FT

5 CORE RESEARCH & EDUCATIONAL FACILITIES

- 200-seat Active Learning Classroom (ALC)
- Center for Advanced Scientific Instrumentation (CASI)
- Center for Integrative Biological Research (CIBR)
- Rooftop greenhouses and walk-in growth chambers
- Student Collaborative Research, Outreach & Learning Laboratory (SCROLL)

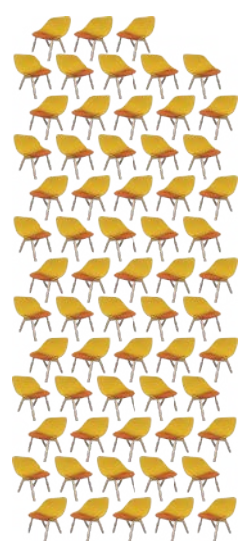
BEGINNING OF LEWIS STREET CORRIDOR

Planned conversion of Lewis Street across north campus to a pedestrian corridor.



MOVING IN

124 occupants representing 12 departments across campus moved into the building over the spring and summer months of 2022.



63
Graduate Students



41
Faculty & Staff



20
Post-docs

STUDENTS IN THE ACTIVE LEARNING CLASSROOM (ALC)

During the ALC's first open semester

1,500+
students will experience active learning



FALL 2022 SCHEDULE

MWF

Organic Chemistry
Ecology
General Biology (3 sections)
General Microbiology
Integrative Physiology

T/TH

Human Anatomy
General Chemistry I
Genetics

CENTER FOR ADVANCED SCIENTIFIC INSTRUMENTATION (CASI)

CASI is a state-of-the-art core facility for imaging science and will provide resources and training to faculty and student researchers across campus and the state, and contract users from across the country. The six instruments below will make up the first group of instruments purchased for the facility, and are expected to be in the building by early 2023, housed on the 1st, 3rd, and 5th floors. Instruments in CASI have wide-ranging applications, from life sciences, agriculture, microbiology, pharmacy, chemistry, earth sciences, archaeology and paleontology, the oil and gas industry, battery and solar cell research, physics, and materials science, among others.

FOCUSED ION BEAM SCANNING ELECTRON MICROSCOPE (FIB-SEM)

Images atomic scale structure using a focused beam of ions and allows scientists to mill and manufacture nano structures.



TRANSMISSION ELECTRON MICROSCOPE (TEM)

Images atomic scale structure using a beam of electrons passing through an ultrathin specimen.

X-RAY DIFFRACTOMETER

Provides detailed information about the internal lattice of crystalline molecular solids, including unit cell dimensions, bond-lengths, bond-angles, and details of site-ordering.



HIGH-THROUGHPUT PLANT PHENOTYPING SYSTEM

Performs very fast, automated measurements of plants, including multi-spectral imaging and 2D and 3D reconstructions to help scientists quantify plant traits, allowing them to measure plant health, water content, stress, and disease.

SPINNING DISK CONFOCAL MICROSCOPE

Uses a spinning, opaque disk with hundreds of pinholes arranged in spirals, rotating at high speeds, to scan across a sample. The microscope then images multiple, thin 2D slices of a sample and constructs a 3D model from them.

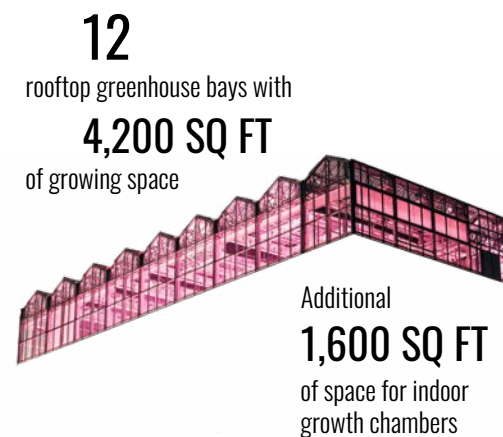


MICRO COMPUTED-TOMOGRAPHY SCANNER (MICRO-CT)

Will allow for high resolution, detailed, non-destructive X-ray scans of the internal anatomy of animals and museum specimens without any damage to the specimens, giving important insight into the functioning of artifacts.

CENTER FOR INTEGRATIVE BIOLOGICAL RESEARCH (CIBR)

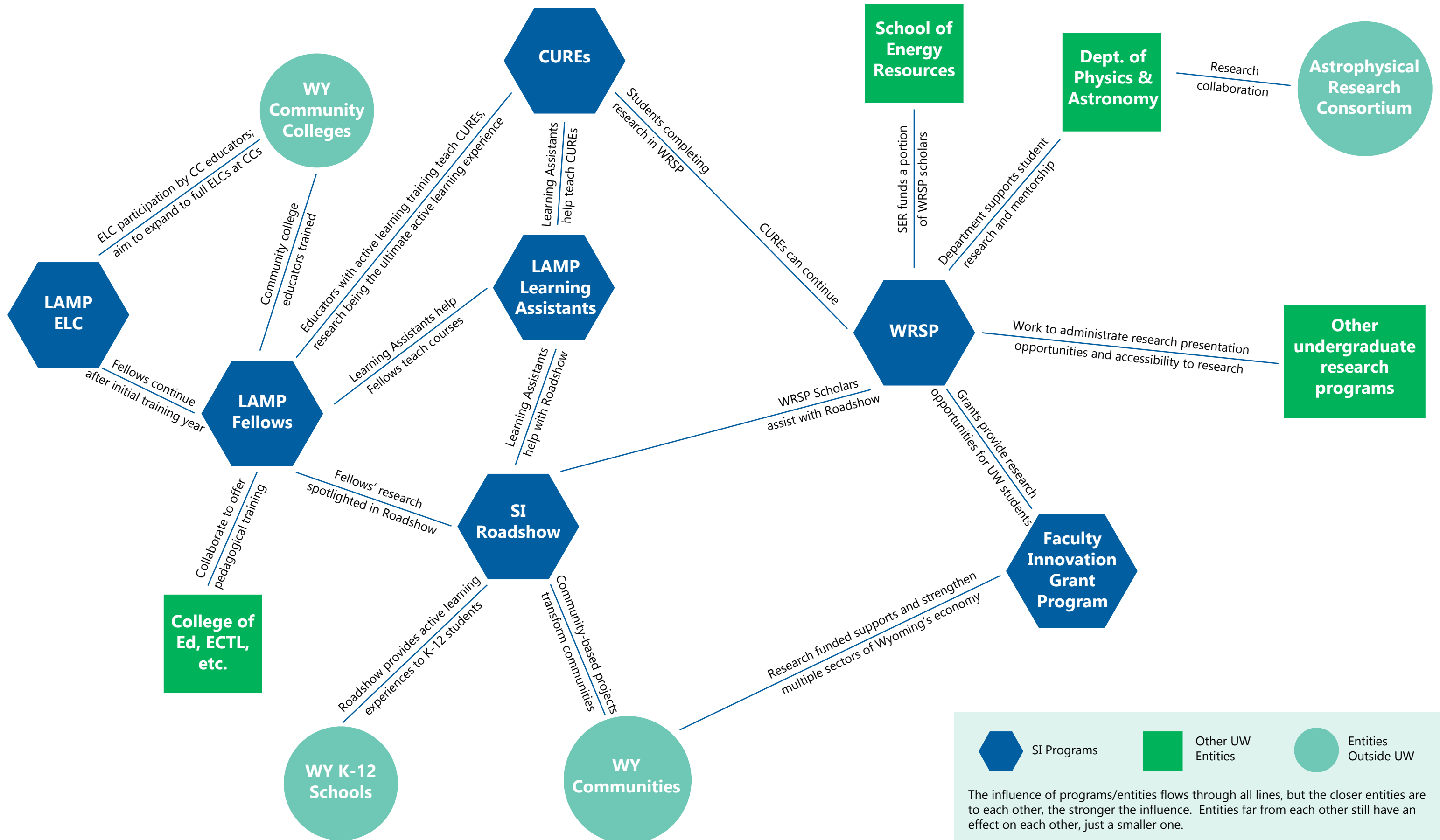
Spread across all floors of the SI Building, CIBR brings together UW's world-recognized biologists within shared laboratories and collaborative spaces to foster innovation and research activities spanning spatial scales from molecules to earth systems, and temporal scales from seconds to thousands of years.



The north wings of the building include shared laboratories housing faculty, post-doctoral fellows, and graduate students representing

9
departments

SI PROGRAM INTERACTIONS



SI'S SIGNATURE
PROGRAMS



LEARNING ACTIVELY MENTORING PROGRAM

IMPROVING STUDENT RETENTION,
SUCCESS, AND ENGAGEMENT IN UW STEM
CLASSROOMS THROUGH COMPREHENSIVE,
SUSTAINED MENTORING AND PROFESSIONAL
DEVELOPMENT FOR FACULTY





LAMP is a comprehensive, sustained mentoring and professional development program with an emphasis on how to best adopt active learning strategies in large-scale active learning classrooms at UW and in classrooms across the state's community colleges.

Program Goals:

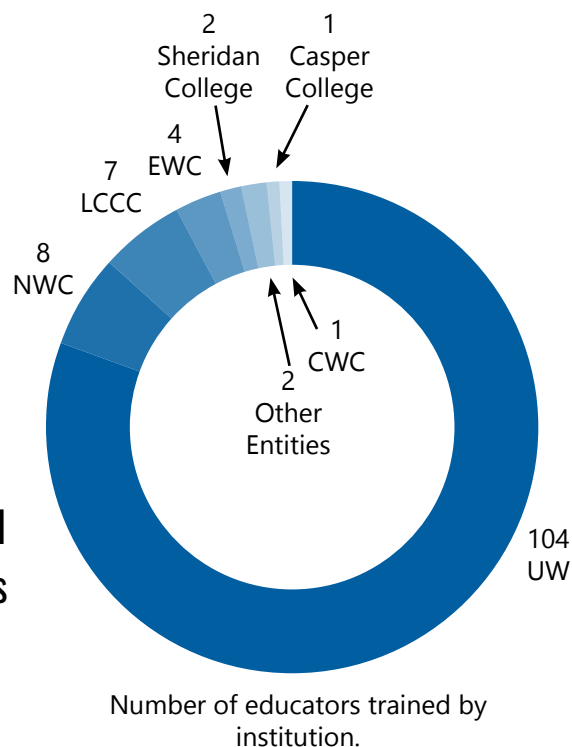
1. Improve student retention, success, and engagement in STEM classrooms.
2. Enable all new and most existing STEM teaching faculty and teaching assistants at UW to become trained in active learning strategies by 2022.
3. Conduct research on active learning in STEM classrooms to investigate relationships between teaching practices and student success, literacy, engagement, and inclusion.
4. Establish professional development and collaboration opportunities for science instructors across the state, including community college instructors and K-12 teachers, to improve learning experiences for all Wyoming students.

LAMP FELLOWS THROUGH TIME (2016-2022)

The LAMP Fellows Program is an immersive, year-long educational development opportunity designed to facilitate instructors' incorporation of active learning techniques into the STEM courses they teach at UW and at community colleges across the state. The program began in the 2016-2017 academic year and enrolled a new class of educators each year until 2020, when classes began enrolling every other year.

129
fellows from
7

WY institutions of higher education and 2 outside institutions have completed the yearlong training



Since 2016, **104** LAMP-trained educators at UW have impacted

25,147
students in
599
active learning classes

LAMP FELLOWS 2021/2022

The 2021/2022 class of LAMP Fellows completed their yearlong training on May 6th, 2022. Their year of training included an immersive summer institute focused on place-based education, fall and spring workshops, and the supported design, development, and implementation of an active learning strategy. Instructors all implemented backwards course design that embedded formative and summative assessment and was informed by either or both: Columbia's Five Principles of Inclusive Pedagogy and/or Universal Design for Learning. All instructors also workshoped their teaching philosophy such that it now integrates their learning and metacognitive growth throughout the year.

The instructional strategies implemented by the fellows ranged from the integration of team-based learning into courses like Environmental Engineering and Craniofacial Disorders to the use of a flipped classroom in Agroecology. At the end of the academic year, fellows presented their strategies in the Active Learning Classroom of the new Science Initiative Building. Each poster shared details about the philosophy guiding instruction, the student learning outcomes, the active learning modalities, and the assessment strategies used to monitor student learning. Also at this culminating ceremony, each LAMP fellow received a completion certificate documenting their pedagogical achievements.

34
2021/2022 fellows

LAMP fellows by institution, academic year 2021/2022.

INSTITUTION	# OF FELLOWS
Casper College	1
Central Wyoming College	1
Eastern Wyoming College	2
Northwest College	1
University of Wyoming	26
Other Entities	2

LAMP fellows by title, academic year 2021/2022.

TITLE	# OF FELLOWS
Assistant Lecturer	1
Assistant Professor	12
Associate Professor	4
Graduate Student	10
Instructional Lab Coord.	1
Instructor	1
Lecturer	1
Program Manager	1
Research Scientist	1
Science Consultant	1

LAMP fellows by department or program, academic year 2021/2022.

DEPARTMENT/PROGRAM	# OF FELLOWS	DEPARTMENT/PROGRAM	# OF FELLOWS
Ag & Applied Economics	1	INBRE	1
American Indian Studies	1	Math/Sciences	1
Biology	1	Mathematics	1
Botany	4	Pharmacy	1
Chemistry	3	Physics & Astronomy	2
Civil & Arch Engineering	1	Psychology	1
Comm Disorders	2	WYGISC	1
Computer Science	1	WY Dept of Ed	1
Ecosystem Sci & Mgmt	2	WY Inst for Disabilities	1
Electrical and Computer Engg	1	Zoology & Physiology	4
Env & Natural Resources	2		



In the 2021/2022 academic year, 46 LAMP-trained educators at UW impacted

4,071

students in

133

active learning classes

Student enrollment by discipline in LAMP fellow-taught active learning classrooms, academic year 2021/2022.

DISCIPLINE	ENROLLMENT
Biological Sciences	1,518
Physical Sciences	1,186
Engineering	316
Environment & Natural Resources	188
Honors	184
Agriculture	175
Mathematics	145
Psychology	106
Health Sciences	87
Disability Studies	77
Education	60
Social Sciences	29

Student enrollment by subject description in LAMP fellow-taught active learning classrooms, academic year 2021/2022.

SUBJECT DESCRIPTION	ENROLLMENT
Life Sciences	1,034
Chemistry	936
Zoology & Physiology	341
Honors	184
Agricultural Economics	159
Mathematics	145
Civil Engineering	124
Psychology	106
Geospatial Information Science Technology	87
Wyoming Institute for Disabilities	77
Physics	77
Environment & Natural Resources	75
Outdoor Recreation & Tourism Management	72
Earth Systems Science	71
Architectural Engineering	69
Speech - Language Pathology	63
Molecular Biology	60
Elementary Education	54
Petroleum Engineering	48
Electrical Engineering	44
Pathobiology	43
Computer Science	31
Gender & Women's Studies	29
Geography	24
Astronomy	24
Pharmacy	22
Botany	18
Renewable Resources	12
Soil Sciences	11
Microbiology	11
Geology	8
Secondary Education	6
Agroecology	4
Social Work	2

LAMP SUPPORTS WYOMING'S HOWARD HUGHES MEDICAL INSTITUTE (HHMI) INCLUSIVE EXCELLENCE EFFORTS

LAMP Director Rachel Watson leads Wyoming's Howard Hughes Medical Institute (HHMI) Inclusive Excellence team. Wyoming is one of only 15 institutional teams nationwide to be a part of the National Learning Community devoted to inclusivity in 2-year to 4-year transfer pathways. In Phase I of this award, Wyoming was awarded \$30,000 to perform an institutional ethnography at all of the state's community colleges. Institutional ethnography is a qualitative technique that entails collecting stories (through focus groups and interviews) from those individuals (specifically educators including faculty and staff) who are daily impacted by inequitable institutions. To date, we have traveled to 5 of the 8 community colleges (Northwest College, Eastern Wyoming College, Laramie County Community College, Western Wyoming Community College, and Casper College) and engaged with educators through focus groups at each of these 5 institutions. Simultaneously, we have connected 2-year and 4-year STEM educators and facilitated the growth of a larger and more supportive social network. At Northwest College in Powell, WY, we have launched an educator learning community centered on increasing inclusion through transdisciplinary research. This Northwest learning community is planning a statewide showcase to enable connections to be built across disparate disciplines from zoology to graphic art.

The National Learning Community is currently in the iterative process of writing the Phase II Grant Proposal. This National Learning Community will receive \$8.8 Million to implement a suite of projects including 2-year to 4-year learning communities such as the one being piloted at NWC. These funds will enable the Wyoming team to implement learning communities at the remaining 4 community colleges listed above and expand relationship networks between UW and these community colleges.

LAMP HOSTS 3-DAY WORKSHOP IN THE ACTIVE LEARNING CLASSROOM IN THE NEW SCIENCE INITIATIVE BUILDING

From May 18th through the 20th, 15 educators gathered for a LAMP training on Cooperative Learning and Team-based Learning (TBL). Both of these active learning modalities are particularly effective in large-scale rooms such as the new 200-person ALC. Attending educators left these sessions with the skills to implement these techniques in their own classrooms and with the knowledge of what it felt like to be a student in a cooperative or TBL class. Additionally, the educators learned how to write specific and measurable learning outcomes and explain the classroom conditions that can allow the brain to learn best. Reflective practice was built into each day's session and educators had the opportunity to work with small groups to glean others' perspectives and learn from their colleagues' ideas. Rhiannon Jakopak (Haub School), Deepthi Amarasuriya (NWC Physics) and Christine Boggs (ECTL) served as learning assistants (LAs) for this workshop. They were able to model LA best practices so that each of the educators could envision how they would employ LAs in their active learning courses.

LAMP SUPPORTS GRADUATE STUDENT OUTREACH AND ENGAGEMENT EFFORTS

LAMP Director Rachel Watson serves as the faculty advisor for the graduate student group Community Outreach Engagement Program in STEAM Education (COPSE). Committed to melding science and the arts, COPSE engages statewide educators and K-12 students in innovative outreach projects. On August 4-6, 2022, COPSE will host the EON Conference, which will connect outreach efforts at UW and educators across the state.



LAMP FELLOWS MAKE BIG IMPACTS AND ARE AWARDED WITH HIGH HONORS

Prior LAMP fellows continue to utilize their training to make big impacts. Danny Dale, Associate Dean of the College of Arts and Sciences, as well as a Professor of Astronomy & Astrophysics, was awarded the WYO-Gold Teacher of the Year, which is awarded by the student organization of the UWAA. Danny has also made an indelible impact on the LAMP program as a whole, as he was a part of the inaugural LAMP fellows cohort in 2016-17, and also serves as a mentor for LAMP fellows.

Two LAMP fellows were honored by UW Mortar Board seniors as "Top Profs" this year, as well. Kerry Sondgeroth was a 2017-18 LAMP fellow, as well as a former ELC member, and is an Associate Professor in Veterinary Science. Ginka Kubelka was a 2019-20 LAMP fellow and is a Lecturer in the Chemistry department and will be a part of the upcoming 2022-2023 ELC.

EDUCATOR'S LEARNING COMMUNITY

Members of the 2020-2021 LAMP Educator's Learning Community included Tawfik Elshehabi (UW Petroleum Engineering), Reshmi Singh (UW Pharmacy), Amy Rhoad (UW Vet Sciences), McKensie Phillips (UW Animal Science), and Deepthi Amarasuriya (NWC Physics). All of these educators performed scholarship of teaching and learning (SoTL) research, and their research was accepted for presentation at the Original Lilly Conference on College Teaching held at Miami University in Oxford, OH. Proposals for this conference are rigorously peer reviewed and the conference itself is considered one of the most preeminent SoTL conferences in the nation.

At the Lilly Conference, Tawfik Elshehabi led conference attendees through an interactive investigation of teaching philosophy construction. McKensie Phillips and Reshmi Singh presented on a study that researched methodologies to inquire into the multidisciplinary teaching, research and scholarship of educators at UW and Wyoming's community colleges. Amy Rhoad presented her use of case studies in a large undergraduate medical microbiology course. Deepthi Amarasuriya presented a poster centering on a novel active-learning strategy called the "layered approach", which is an inclusive pedagogy allowing students to learn in different ways using different resources and metacognitive and small-group approaches. LAMP mentors Christi Boggs and Rachel Watson presented a poster showing increased connectivity in the social network after yearlong LAMP training and the subsequent educator learning community. This corresponds with educators' decreased feelings of isolation, increased feelings of confidence and pedagogical knowledge. The social network analysis also reveals a disproportionate increase in advice-giving for several community members after the second year in the program. They say this may indicate either the need for multiyear development or educator learning community-style cohorts when helping educators become campus opinion leaders and change agents.

In March of 2022, six LAMP educators were selected for the 2022-2023 LAMP ELC: Kimberly Frith (Civil and Architectural Engineering), Diksha Shukla (Computer Science), Kira Heater (LCCC Mathematics), Claire Campion (Zoology/Physiology), Rhiannon Jakopak (Haub School of Environment and Natural Resources), and Ginka Kubelka (Chemistry). On May 21st, these educators gathered for a retreat in the new Science Initiative Building. They became knowledgeable about change theory and began to plan their submissions for the Lilly Conference on College Teaching. Each of these educators has already embarked on a scholarship of teaching and learning project and the ELC will support their data gathering, analysis and communication of their findings.

LEARNING ASSISTANTS

The LAMP Learning Assistants Program began in Spring 2018 and provides UW students with opportunities to assist teaching in large introductory science courses taught in active learning classrooms at UW. Learning Assistants (LAs) act as peer mentors to help facilitate team-based and other types of learning. As many LAs are pursuing employment as K-12 STEM teachers, the program also integrates active learning into their training and gives them valuable teaching experience.

In the Fall of 2021 and spring of 2022, LAs supported educators in Chemistry, Psychology, Physiology, Petroleum Engineering, Agricultural Economics, Education, Microbiology, Life Sciences, Math, Molecular Biology, Science Communication, Civil & Architectural Engineering, and Animal Science. All of these LAs enrolled in a course taught by LAMP Director Rachel Watson and supported by LAs (Ella DeWolf and Claire Campion). In this course, called Best Practices in Active Learning, LAs develop their teaching philosophy and learn enough about active learning that they are able to generate new content for the active learning spectrum.

Since Spring 2018,

82

UW students have been LAs for

169

active learning courses

This academic year

29

UW students have been LAs for

38

active learning courses



SI'S SIGNATURE
PROGRAMS



WYOMING RESEARCH SCHOLARS PROGRAM

PROVIDING UNDERGRADUATE STUDENTS WITH
CUTTING-EDGE RESEARCH OPPORTUNITIES AND
FACULTY MENTORSHIP

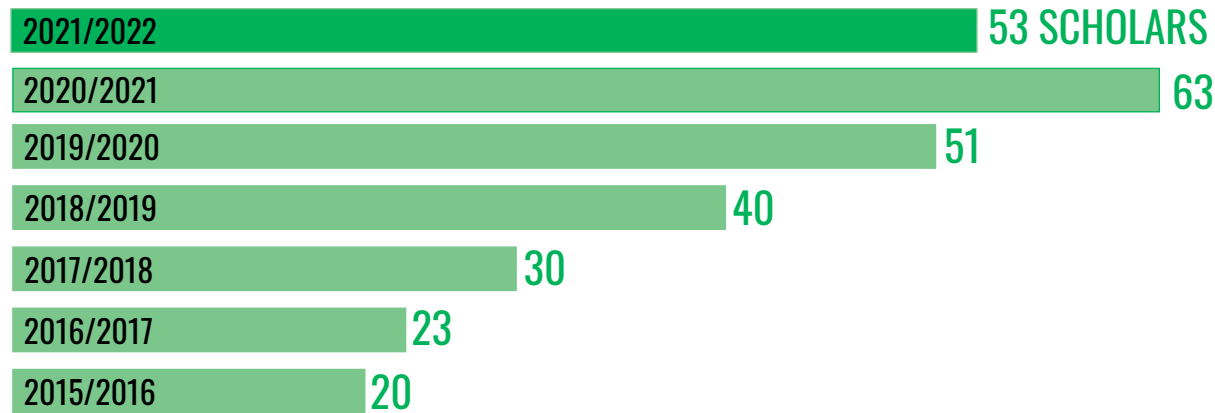


The **Wyoming Research Scholars Program (WRSP)** pairs undergraduate students with faculty mentors to participate in their own cutting-edge research project starting as early as their freshman year. Research experiences through WRSP build confidence and competence in young scholars at a formative stage in their training.

Program Goals:

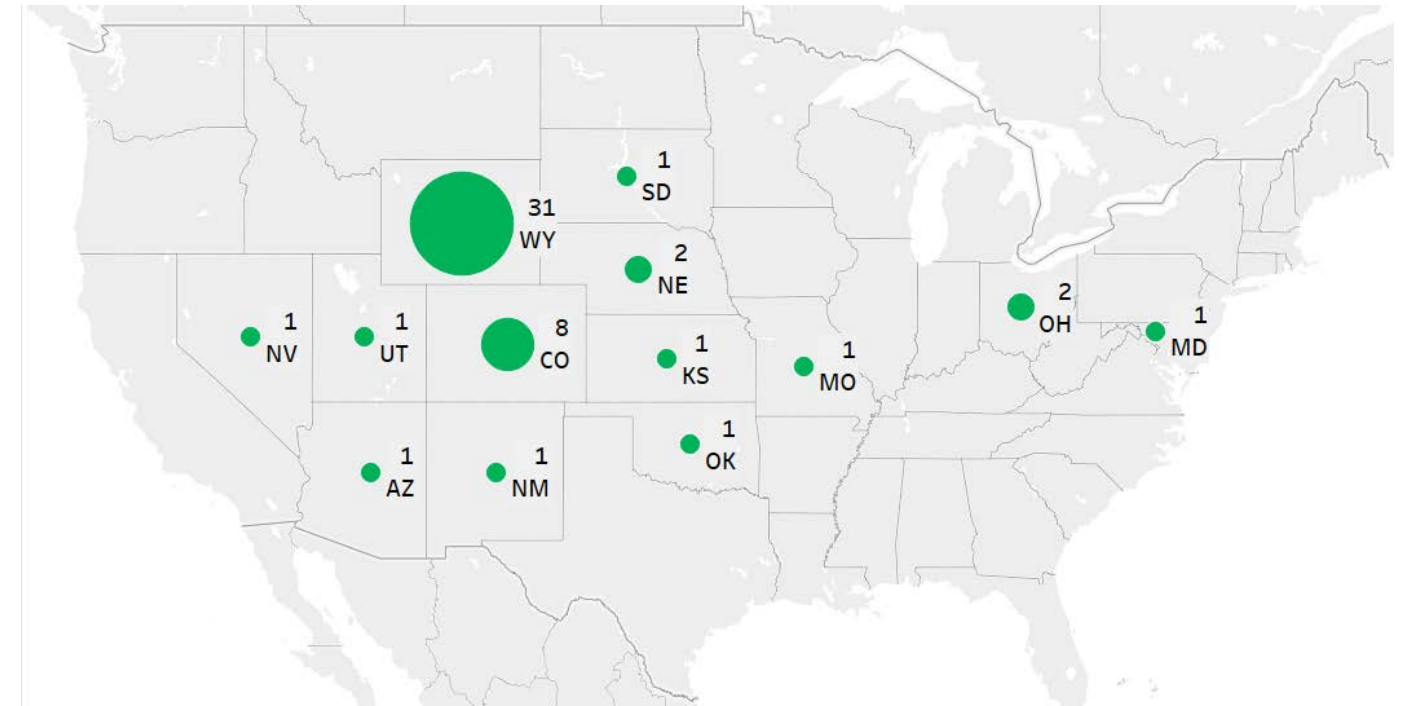
1. Attract high-achieving high school graduates and community college transfer students to UW.
2. Retain promising students in the sciences at UW through early involvement in hands-on science research, department seminars, and public outreach events.
3. Pair talented students with a faculty mentor who can model the scholarship, teaching, service, and outreach activities of a professional scientist.
4. Develop transferable professional skills such as science writing, data analysis, and oral communication through participation in research and public outreach events.

WRSP SCHOLARS THROUGH TIME (2015-2022)



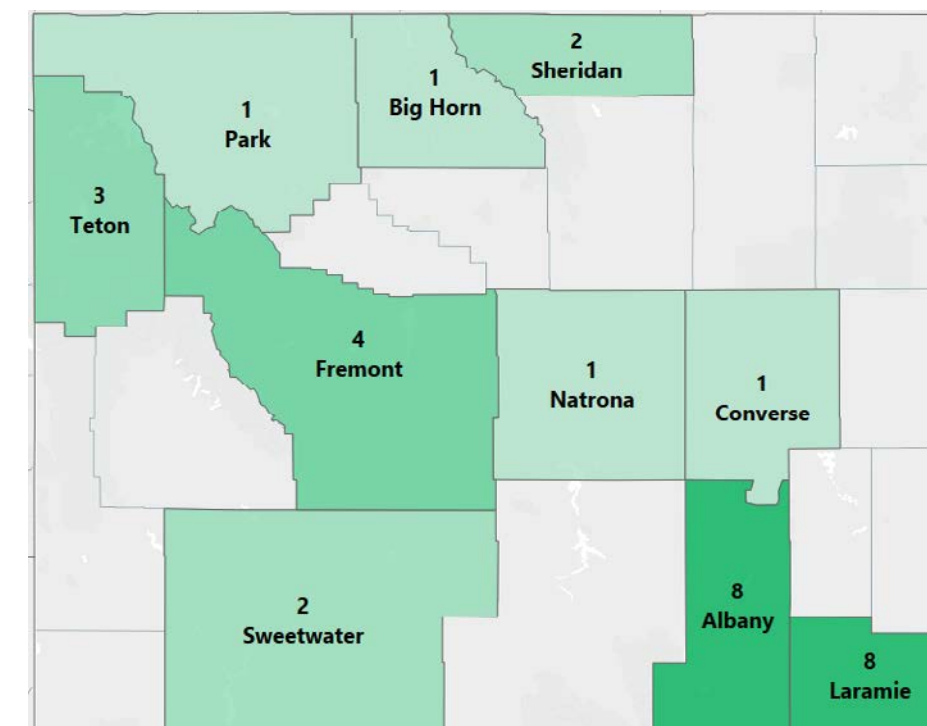
WRSP SCHOLARS 2021/2022

WRSP scholars by state, academic year 2021/2022. Additionally, 1 scholar from India participated in WRSP.



Below: WRSP scholars by Wyoming county, academic year 2021/2022.

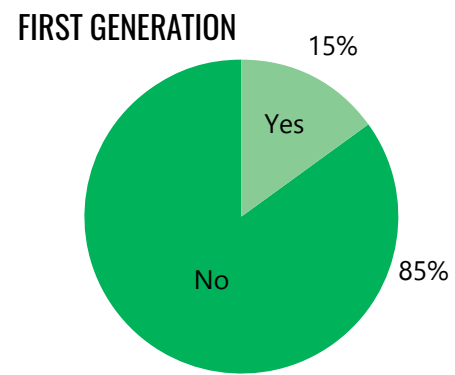
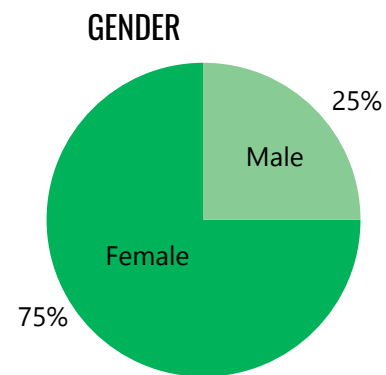
Right: WRSP scholars by Wyoming hometown, academic year 2021/2022.



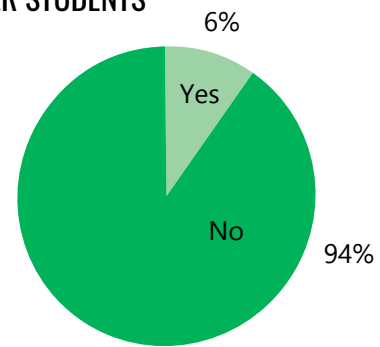
WY CITY	# OF SCHOLARS
Buford	1
Burns	1
Casper	1
Cheyenne	7
Cody	1
Cowley	1
Douglas	1
Dubois	1
Green River	1
Jackson	2
Lander	3
Laramie	7
Moose	1
Rock Springs	1
Sheridan	2



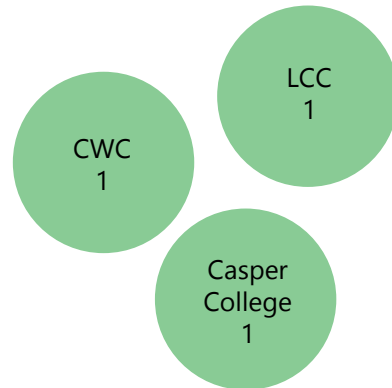
WRSP scholars did
13,089
hours of research



TRANSFER STUDENTS



OF SCHOLARS
FROM



Primary majors of WRSP scholars, academic year 2021/2022.

PRIMARY MAJOR	# OF SCHOLARS	PRIMARY MAJOR	# OF SCHOLARS
Animal & Veterinary Science	1	Geology	4
Anthropology	1	Kinesiology & Health Promotion	1
Astronomy & Astrophysics	3	Mechanical Engineering	1
Biology	4	Microbiology	4
Computer Science	4	Molecular Biology	4
Criminal Justice	1	Physics	5
Earth Science Education	1	Physiology	3
Electrical Engineering	2	Psychology	1
Elementary Education	1	Speech Language & Hearing Sciences	1
Energy Resource Management & Development	1	Wildlife & Fisheries Biology & Management	2
Environmental Geology & Geohydrology	1	Zoology	3
Environmental Systems Science	4		

WRSP SCHOLAR PUBLICATIONS AND PRESENTATIONS

The goals of WRSP include not only exposing undergraduate students to the work of a professional researcher, but giving them the opportunity and resources to actively contribute to these processes. This experience takes research from the theoretical to the practical realm and also provides students research products that greatly strengthen their prospects for further education and employment. Each semester, WRSP scholars report the products of their research, including publications, presentations, outreach, and other creative activities. This academic year, 31 scholars reported on their research activity. These data were augmented with online searches for other research products.

List of presentations and posters given at professional conferences to which WRSP scholars contributed, academic year 2021/2022.

PRESENTATION TITLE	EVENT/CONFERENCE NAME
Sexual dimorphism in immunity to acute toxoplasmosis	American Society of Microbiology - Rocky Mountain Branch Meeting
Sedimentary signatures of holocene snowpack changes in the Snowy Range, Wyoming	American Geophysical Union Fall Meeting
Holocene changes in Rocky Mountain snowpack	American Geophysical Union Fall Meeting
Understanding the role of iron in nutritional immunity during <i>Toxoplasma gondii</i> infection	American Society of Microbiology - Rocky Mountain Branch Meeting
Role of diet in development and recovery from spinal cord injury in larval zebrafish	Front Range Neuroscience Group Meeting
Tired of misattribution, modeling player fatigue in the NBA	Carnegie Mellon Sports Analytics Conference

List of published articles to which WRSP scholars contributed, academic year 2021/2022.

ARTICLE TITLE	JOURNAL TITLE
Burrow webs: Clawing the surface of interactions with burrows excavated by American badgers	Ecology and Evolution
Prevalence and diversity of haemosporidians in a migratory high-elevation hummingbird in North America	Parasitology Research
TOI-532b: The habitable-zone planet finder confirms a large super Neptune in the Neptune desert orbiting a metal-rich M-dwarf host	The Astronomical Journal



WRSP SCHOLAR EXIT SURVEY

Each semester, scholars who complete their fellowship with the WRSP (most by graduating) fill out an exit survey which asks questions about learning outcomes related to their WRSP research and outreach. Also included are questions about future educational and employment plans and questions about WRSP in general. Below are some notable results from the 12 Fall 2021 and Spring 2022 graduates who completed the survey.

On average, scholars reported a **GREAT GAIN** related to their

- Confidence in ability to do research
- Understanding of the overall process of research
- Confidence in ability to contribute to science
- Comfort in working collaboratively with others

10

scholars plan to pursue graduate education and/or employment in their field of study. Scholars remarked that the program gave them confidence in their choices for the future.

Scholars reported that **STRENGTHS** of the program include

- A support network that extended past their lab group
- Guidance for students that aren't sure what their academic and research interests are at the outset
- Paid experience so they were more able to focus on coursework and research

// [Participating in WRSP]... really helped me figure out what path I wanted to take after graduation. By having the opportunity to conduct research at the undergraduate level with support and funding from WRSP, I was able to gain experience on a couple different types of research projects which helped me learn what I did and did not like when it came to my research interests, so it helped me discover what I wanted to do after I graduate. //

// I think being active in a lab group has kind of helped 'demystify' academia in a way that I don't think I would have experienced if I had not been involved in the WRSP. The projects that I have helped work on are all very interesting and exciting, and I have been able to relate a lot of the work to my general coursework in a way that has enhanced my overall undergraduate experience. //

// [WRSP] allowed me an opportunity to integrate myself better into the University, both through working with a lab and through the club aspect of WRSP. Having something to do other than just coursework also elevated the undergraduate experience beyond the expected, especially since completing research and sharing it felt like a more tangible form of intellectual development than just passing classes. //

COURSE-BASED UNDERGRADUATE RESEARCH EXPERIENCES (CUREs)

In the Fall of 2019, CUREs were piloted at UW by WRSP Director Jamie Crait with assistance from an interdisciplinary team of instructors. CUREs have also been developed at other universities as a way to engage students in research at a "scale that is not possible through apprenticeships in faculty research laboratories" (Rodenbusch et al., 2016)¹. Currently, UW's CURE program is being developed as a sequential, three-course series for freshman and sophomore-level students, moving students towards more autonomy in research. The first course in the sequence introduces students to research through developing skills in primary literature analysis, data analysis and visualization, and scholarly communication. The second course gives students deeper knowledge in a specific discipline and training in research methods. The third course focuses on applying skills and knowledge in the context of a research project. After a student finishes the series of courses, instructors help facilitate further research opportunities for students, such as working in faculty labs or participating in internships. Students who finish the sequence will also have the opportunity to serve as peer mentors for new students.

The SI has recently helped to develop a course-based undergraduate research experience (CURE) for first and second year students. In Fall 2021, students in the LIFE 1101 CURE engaged in research in beaver pond ecosystems in the Medicine Bow National Forest. Students investigated a variety of topics, including soil nutrient composition, water quality, and wildlife diversity – all in relation to the impact of beavers on the landscape. Students developed research proposals and delivered their final results in a poster session at the end of the semester. These students are eligible to continue in our three-semester CURE sequence, allowing them to immerse themselves more deeply in their research projects and prepare them to engage in one-on-one mentored research through the Wyoming Research Scholars Program.



Students in LIFE 1101 CURE researching aquatic ecology and setting up trail cameras in Medicine Bow National Forest.

¹Rodenbusch SE, Hernandez PR, Simmons SL, Dolan EL (2016). Early Engagement in Course-Based Research Increases Graduation Rates and Completion of Science, Engineering, and Mathematics Degrees. *CBE - Life Sciences Education*, 15(2), 1-10.

SI'S SIGNATURE
PROGRAMS



SCIENCE INITIATIVE ROADSHOW

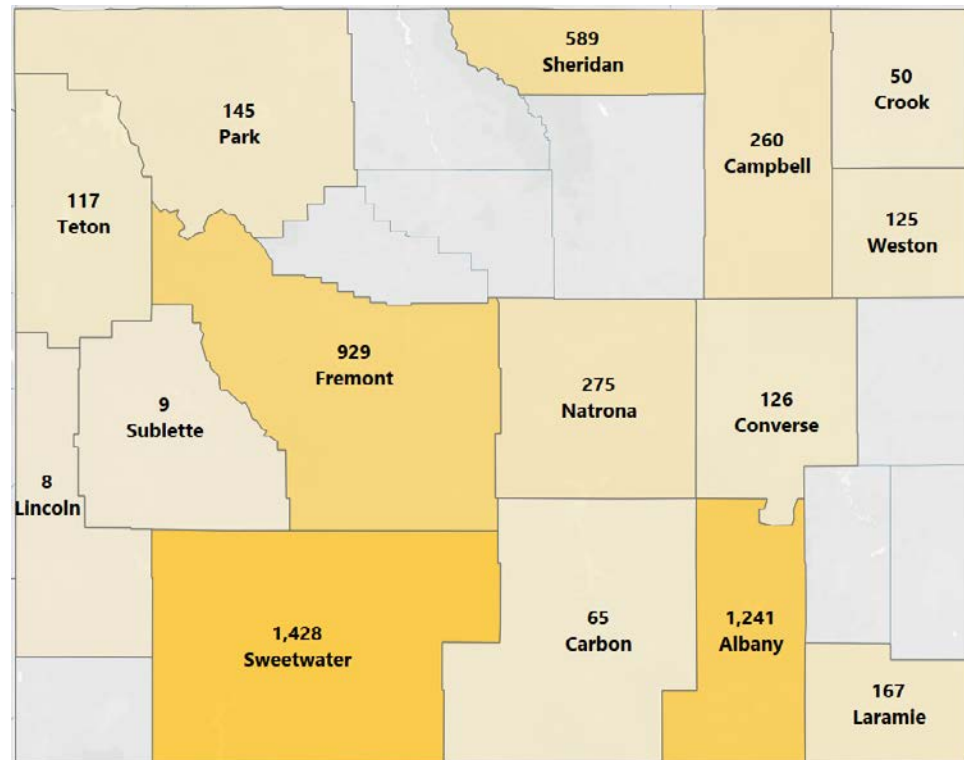
BRINGING ACTIVE LEARNING TO
K-12 STEM CLASSROOMS ACROSS
WYOMING



Teams of undergraduate and graduate students from UW, including WRSP Scholars and LAMP Learning Assistants, along with UW faculty and staff, facilitate in-person and virtual learning in K-12 STEM classrooms across the state using active learning techniques through the **Science Initiative Roadshow**. The teams from UW work with K-12 teachers to integrate learning experiences into existing curricula in order to achieve assigned learning outcomes. This collaborative approach exposes Wyoming students and teachers to innovative active learning techniques and creates links between UW and schools across the state to improve STEM teaching statewide.

THE SCIENCE INITIATIVE ROADSHOW THROUGH TIME (2017-2022)

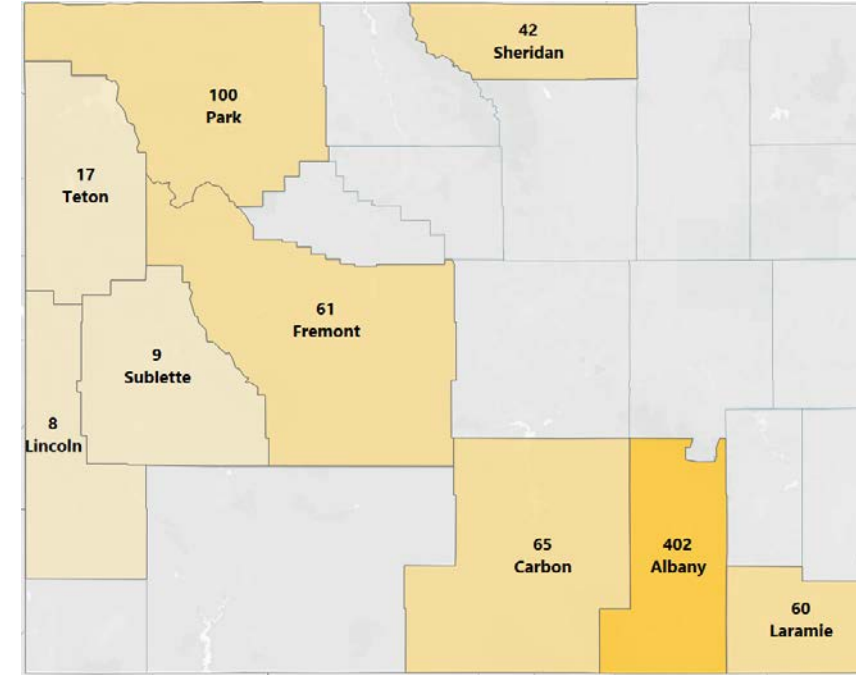
Number of K-12 students reached, 2017-2022. Students who took part in some in-reaches may not be included in the map as they came from various counties.



Since 2017, the Science Initiative Roadshow has brought active learning to **5,612** K-12 students from **15** Wyoming counties

THE SCIENCE INITIATIVE ROADSHOW 2021/2022

Number of K-12 students reached, academic year 2021/2022. Students who took part in some in-reaches may not be included in the map as they came from various counties.



In the 2021/2022 academic year, the Science Initiative Roadshow brought active learning to **838** K-12 students from **9** Wyoming counties

DATE	CITY	SCHOOL/PROGRAM	# OF STUDENTS
6/17, 7/26, & 8/9/2021	Laramie	Laramie Rec Center	72
6/28 - 7/1/2021	Jackson	Teton Literacy School	17
10/15/2021	Hanna	HEM Junior/Senior High	65
12/1/2021	Pinedale	Skyline Academy	4
2/17/2022	Sheridan	Sheridan YMCA Afterschool	42
3/1/2022	Riverton	Riverton Middle School	61
3/3/2022	Cody	Cody Middle School	100
3/9/2022	Cheyenne	Cheyenne Central High School	60
3/29/2022	Laramie	Laramie High School	103
4/21/2022	Laramie	Laramie High School	180
4/29/2022	Afton	Star Valley High School	8
5/2 - 5/3/2022	Pinedale	Skyline Academy	5
5/17/2022	Laramie	Women In STEM Conference	74
5/18 - 5/20/2022	Laramie	Snowy Range Academy	22
4/2, 4/9, 4/16, 4/30, & 5/21/2022	Laramie	Teen Science Cafes	25

65 outreach & inreach events

30+ schools & afterschool programs

20 WY communities



THIS YEAR IN THE ROADSHOW

Engagement events this year incorporated leadership from at least 10 UW faculty/staff, 13 graduate students, and 20 undergraduate students, providing rich STEM outreach opportunities for the members of the UW community in addition to educators and youth across the state. In addition to STEM opportunities provided throughout communities in Wyoming, the Roadshow also hosted many in-reach STEM events at the UW Laramie campus. These various in-reach and outreach events incorporated STEM topics ranging from migration and engineering, to neuroscience, physics, microbiology, ocean acidification, and much more. The Roadshow opportunities were also diverse in age-range reaching K-5th grade youth in an afterschool program in Sheridan, to middle school students in Cody, and high schoolers in Pinedale.

THE ROADSHOW HIRES STUDENT OUTREACH ASSISTANTS

In the spring 2022 semester, the Roadshow was able to hire five Outreach Assistants (OAs) who were paid to support the efforts of STEM outreach and in-reach events. The five selected students consisted of two undergraduates: Elizabeth Lungren (majoring in animal and veterinary sciences) and Austin Bernard (majoring in mechanical engineering), and three graduate students: Kathryn Sandum (PhD Program in Biomedical Sciences), Quiana Jeffs (PhD Program in Neuroscience), and Katie Davis (PhD Program in Ecology). These OAs were instrumental in the planning, design, and implementation of outreach and in-reach events throughout the spring semester. The students were required to attend weekly Roadshow meetings and then work together to build hands-on STEM curriculum related to the needs of the educators we collaborated with throughout the spring semester. The OA opportunity created a rich, dedicated group of students that developed and lead transformative learning opportunities for K-12 students throughout Wyoming. The ability to hire these fantastic students was generated from the generous donations from Rocky Mountain Power and Union Wireless. The Roadshow plans to continue these positions and fund up to five OAs in subsequent semesters, giving students the opportunity to grow in their STEM outreach and engagement skills.

OUTREACH FEATURE: SKYLINE ACADEMY ALTERNATIVE HIGH SCHOOL IN PINEDALE, WY

The Roadshow received a 2022 Markow Grant from the Wyoming Native Plant Society to fund a multi-day trip to Skyline Academy in Pinedale to teach high school students about the importance of trees, a topic and learning outcome of their curriculum. Mark Lyford and Karagh Brummond coordinated with Lori Moore, the science teacher at Skyline Academy, to develop and implement the field-based research curriculum. Students spent the first day in the classroom connecting concepts related to how Wyoming vegetation is linked to global systems like the Carbon cycle. Students were able to learn about the anatomy and physiology of trees and link that information by determining the age of trees and making rough measures of tree ring size to build an understanding of the relationship between climate, tree growth, and how growth relates to carbon uptake and storage.

On the second day, the students took a local field trip to the base of the Wind River Range to estimate the amount of carbon storage in a local forest and learn about some basic methods used in tree-based field studies. The students learned how to take transects to estimate the number of trees and measured tree diameter to help estimate the amount of carbon storage. We then returned to the classroom and performed calculations to draw conclusions from the research experiment, as well as discussing the importance of trees.

OUTREACH FEATURE: THREE-DAY FIELD OUTREACH IN CURT GOWDY STATE PARK

Over three days (May 18-20), the 5th grade students at Snowy Range Academy (SRA) in Laramie embarked on a field-based scientific investigation to learn and apply the scientific method. Karagh Brummond collaborated with the 5th grade teacher, Diane Cook, to align the outreach opportunity with the teacher's curriculum needs. The 21 SRA students were divided into four groups to begin field research in Curt Gowdy State Park. UW and SI faculty Jamie Crait and Mark Lyford oversaw two of the groups. Two UW graduate students, Ellen Polites and Eva Smith led the third research group, and graduate student Katie Davis led the fourth group.

On the first day of the field research experience, the students spent the day hiking in Curt Gowdy, making observations relevant to their area of research. The UW researchers helped to draw attention to potentially relevant observations and create questions about the landscapes and phenomena around them. By the end of the first day, the students determined their group research questions from their observations and determined which methods they would need to use to collect data needed to address those questions.

The students then spent the entire second day in the field collecting data. Mark Lyford's group counted trees along transects and took soil moisture readings along slopes to examine the relationship between topography, soil moisture, and tree density in the park. Jamie Crait's group collected measurements related to dissolved oxygen and water temperature as well as sampling for aquatic invertebrates to examine the relationship between water quality and invertebrate changes over a stream gradient. The group led by Ellen Polites and Eva Smith measured the sizes of rocks along a slope from top to bottom to examine the relationship between rock size and elevation to answer questions related to erosion. Finally, the group led by Katie Smith took point counts of birds and identified birds at three different sites within the park to examine the relationship between habitat type and bird abundance and diversity.

On the third and final day of the outreach experience, the researchers and students met at SRA to analyze and draw conclusions from the data they collected in the field. The students and researchers then worked together to create presentations which they gave to their classmates, SRA teachers, principal, and researchers.

NSF TEEN SCIENCE CAFÉS

This past year, Karagh Brummond received a Rural Fellowship from the Teen Science Café Network. The network is a community of practice that provides resources and support for individuals and organizations looking to implement Teen Science Cafés. The cafés themselves are a fun, free way for teens in the community to experience out-of-school programming in STEM and hear from science experts in their local community. Karagh was able to attend professional development opportunities and implement five teen science cafes for teens in the Laramie community. Teens learned from local experts in computer science, astronomy, neuroscience, athletic training, and even teamed up with the local salamander migration initiative! Short summaries of the cafés and photos are available on the Science Initiative Engagement website. Katie Davis, graduate student in the Program in Ecology, was instrumental in supporting the Teen Science Cafés and helping to build the foundation for more cafés to come. Looking forward, we hope to continue to support the development and implementation of Teen Science Cafés in Laramie and other rural areas across Wyoming. Experts interested in offering a café and teens looking to get involved can reach out to Brummond (kmurph17@uwyo.edu).

GOALS & METRICS

At the outset of the Science Initiative, the Governor’s Task Force agreed upon 7 guiding metrics for assessing the impacts of programming related to student outcomes and success, science teaching, and research funding and productivity. These foundational metrics were formulated to collectively lead the UW core sciences into the top quartile of its competitor institutions, and are relevant to the full implementation of both Phases I and II as outlined in the Governor’s Task Force Report. The Science Initiative is still in the midst of Phase I, so baselines for measuring metric data are being established. As implementation of Phase I and Phase II continue, changes from the baseline can be measured. Also, as priorities and goals for the university as a whole take shape, appropriate peer institutions will be selected to measure overall competitiveness of the core sciences at UW. The below will outline baseline assessment for select key metrics.

METRIC 1

Increase the number of undergraduate students involved in high-quality, productive research experiences by 100% after full implementation of the Science Initiative.

The WRSP, along with multiple other undergraduate research programs at UW, provides transformative research experiences for undergraduate students across the disciplines. In the period from Fall 2010 – Spring 2015 (the 5 academic years preceding implementation of WRSP, which began in fall of 2015), we estimate that 105-115 students were taking part in 1-to-1 mentored research in 7 programs across campus. Data from program directors and program websites were used for this approximation. As we knew this was an approximation, we also used data from the UW library’s Undergraduate Research and Inquiry Day database to assess the number of students presenting research in the same years preceding implementation of WRSP. After accounting for engineering students presenting senior design projects, community college students, and others, approximately 110 students were presenting research each year. Therefore, a baseline of 110 students involved in high-quality productive research experiences was set. WRSP’s current capacity for student scholars is approximately 55, so the program has reached 50% progress in meeting the goal of metric 1.

We also believe that course-based undergraduate research experiences can provide students with both high-quality and productive research experiences; therefore, in the future, we plan to include CURE enrollment in this metric. Most likely, only students enrolled in the full 3-course series will be included in the analysis. We do know there are multiple courses at UW currently offered that include many elements of a CURE, so are aware our estimate of impact leaves these out of the analysis. Therefore, continued growth in 1-to-1 mentored research, coupled with the planned centralization and formalization of the CURE curriculum will greatly improve our ability to assess the number of students who have access to research experiences, and these experiences’ quality and impact.

We see three main avenues for increased expansion of undergraduate research opportunities at UW:

1. Multiple stakeholders on campus are discussing the creation of a collaborative Undergraduate Research Office, which would increase accessibility to and collaboration related to research for students and faculty mentors.
2. Full funding for the WRSP program, including a second program director and with it the capacity to enroll two times the number of students into the WRSP.
3. Full implementation of CUREs across campus, which would integrate mentored research into the curriculum for students across all disciplines, increasing involvement in undergraduate research experiences by much more than 100%. This would effectively transform core educational requirements for all students and greatly increase access to these experiences.

METRIC 4

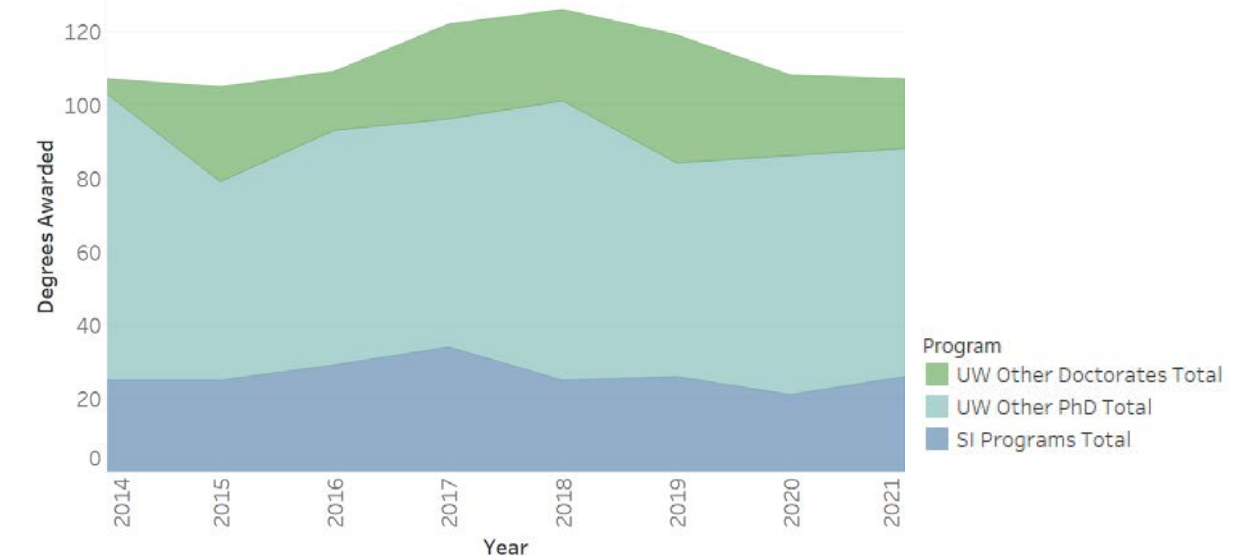
Increase the number of doctoral students graduated in each Science Initiative department by 25% after full implementation of the Science Initiative.

One of the Science Initiative’s planned signature programs, the PhD Scholars program, will draw the best doctoral students from the U.S. and worldwide, augmenting their training with strong research and teaching components. The program will continually provide funding for a total of 20 prestigious PhD awards within the five core Science Initiative departments. Each PhD scholar will undergo training in outreach and will perform one semester of active learning classroom teaching (through LAMP) and/or undergraduate research mentorship (through WRSP), in addition to performing doctoral research. As with other programs, the PhD Scholars program will be enriched by each of the other SI programs.

In Spring of 2018, a pilot of the program was launched. A total of \$100,000 was awarded in one semester to 8 PhD students who were nearing graduation, each representing a different academic department. Each of these students had been supported by state funding, which requires a teaching component each year, so the pilot funding was meant to give students more time for dissertation writing, speeding their progress toward graduation at the end of their studies (almost all students graduated within 1 year of the award, with one graduating in 1.5 years and another in 2 years).

As funding for this program is still to be secured, the below figure provides baseline data from which we will measure changes in graduating PhDs. Over the past 8 academic years, Science Initiative PhD programs (Botany, Chemistry, Ecology, Hydrologic Sciences, Molecular & Cellular Life Sciences, Molecular Biology, Neuroscience, and Physics) graduated, on average, 26 PhDs annually. These degrees accounts for 29% of PhDs awarded at UW, and 23% of all doctorate degrees awarded at UW (other degrees including EdD and DNP degrees). With the full implementation of the PhD Scholars program, and 5 awards given each academic year (for a total of 20 awards over 4 years), we expect that 5 more PhDs will be awarded each year, increasing the number of PhD degrees awarded in SI Programs by 15%. We are hopeful that increased faculty research grant funding, including funding for graduate student research assistantships, will assist in contributing to the final 10% increase in PhD degrees awarded to reach an increase of 25%.

DEGREES AWARDED BY SI PHD PROGRAM



GOALS & METRICS

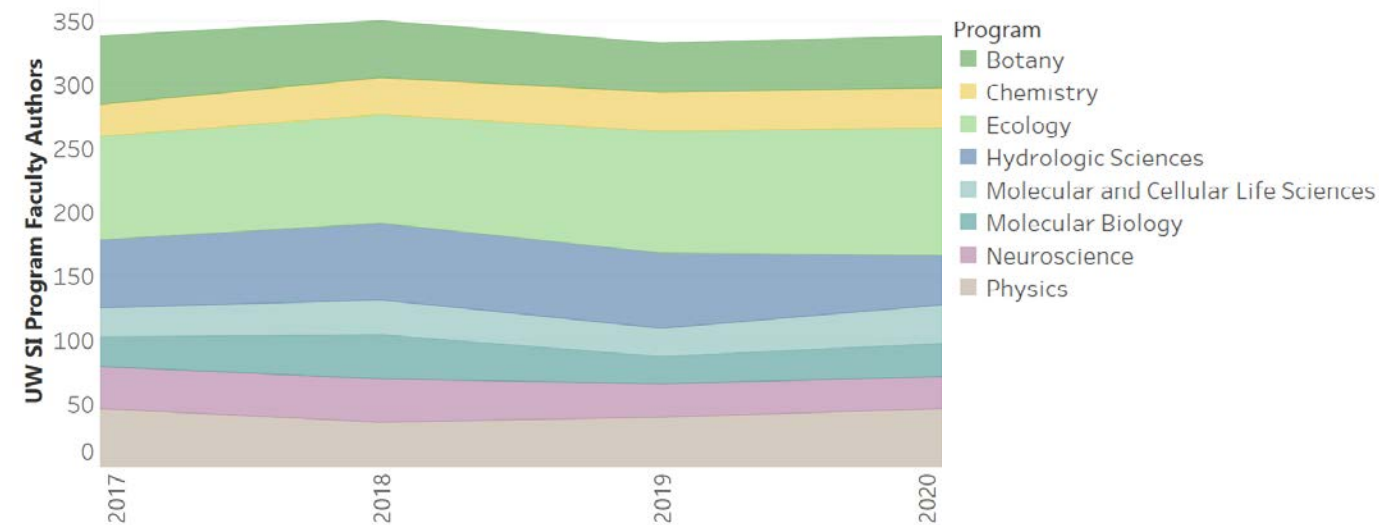
METRIC 5

Increase the number of published peer-reviewed manuscripts by Science Initiative faculty and students by 25% after full implementation of the Science Initiative.

Programs such as the Faculty Innovation Grant Program and the PhD Scholars Program, in conjunction with core facilities, such as the Science Initiative Building (including CASI, rooftop greenhouses, etc.) and others planned for the future (renovated spaces and the proposed new observatory on Jelm Mountain) are expected to augment research collaboration and capacity in STEM fields, leading to an increase in the number of publications.

The figure below shows the number of UW SI faculty authors on published, peer-reviewed manuscripts for the years 2017 -2020 (years currently available for analysis in the Academics Analytics database). Important notes on the data include that this is not an absolute count of articles that included any number of faculty members from UW SI programs. UW SI faculty members were listed as authors on 1,218 published, peer-reviewed manuscripts over the time period considered (or an average of 305 per year). For the purposes of this analysis, authors were counted, not just manuscripts, to give a clearer account of scholarly output and collaboration. Over the 1,218 (305 annually) manuscripts, there were a total of 1,358 UW SI program faculty member authors, for an average of 340 author credits annually. At this point, because of data availability, inclusion of graduate and undergraduate student publications is not feasible.

UW SI PROGRAM FACULTY MANUSCRIPT AUTHORS BY YEAR AND PROGRAM



METRIC 6

Increase dollar value of grants and contracts by 25% indexed to federal research funding levels after full implementation.

Programs such as the Faculty Innovation Grant Program and the PhD Scholars Program, in conjunction with core facilities, such as the Science Initiative Building (including CASI, rooftop greenhouses, etc.) and others planned for the future (renovated spaces and the proposed new observatory on Jelm Mountain) are expected to augment research collaboration and capacity in STEM fields and contribute to increases in grant funding from federal agencies, as well.

Baseline data for grants indexed to federal funds begin in the federal fiscal year of 2017, as Wyocloud data begin here. For the purposes of this data, the federal fiscal year was used, which begins in October and ends in September of the following year (so FY 2021 spans from October 1, 2020 to September 30, 2021). One other note on the data is that many funds indexed to both INBRE and EPSCoR are disbursed to faculty members within SI programs; however, as subgrants can be spread among faculty within and outside of SI programs, and because determination of exactly where each portion of these funds is disbursed can prove prohibitively complicated, INBRE and EPSCoR are left out of the analysis below (although they are being tracked). Some funds for INBRE and EPSCoR are attributed to single SI departments, however, and so those are included.

As large-scale 4-5 year programs phase in and out, amounts within certain programs may fluctuate, but the general trend seen is a dip in funding in the middle of the reporting period followed by a healthy increase in FY 2021. The current US president's administration and Congress are looking to significantly boost the budget of the National Science Foundation (although these efforts did not come to fruition in FY 2022), so this external impetus may also boost federal funding for UW even more if we position ourselves to attract these funds.

Grant funding from federal sources by SI research program by federal fiscal year.

UW PROGRAM	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Botany	\$5,227,911	\$2,743,503	\$1,758,219	\$1,836,690	\$2,220,176
Chemistry	\$1,210,860	\$1,012,151	\$1,322,549	\$1,203,431	\$1,412,773
Molecular Biology	\$3,143,363	\$2,637,576	\$2,480,517	\$3,028,756	\$4,409,171
Neuroscience	\$329,903	\$247,427	-	-	-
Physics & Astronomy	\$1,859,493	\$1,753,249	\$2,133,025	\$2,682,755	\$3,105,045
Zoology & Physiology	\$1,919,551	\$2,877,892	\$2,995,086	\$3,251,864	\$4,811,505
Totals	\$13,691,081	\$11,271,798	\$10,689,396	\$12,003,505	\$15,958,670

Grant funding to SI research programs from federal sources by federal agency and federal fiscal year.

FEDERAL AGENCY	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Army Corps of Engineers	\$2,957	\$739	-	-	-
Department of Agriculture	\$93,968	\$91,567	\$127,308	\$245,492	\$385,876
Department of Defense	\$224,004	\$263,302	\$140,433	\$468,265	\$1,385,150
Department of Energy	\$852,405	\$418,288	\$554,565	\$801,397	\$944,549
Department of the Interior	\$203,730	\$156,610	\$112,554	\$168,198	\$129,197
Department of Health & Human Services	\$4,406,663	\$4,667,431	\$4,217,795	\$3,978,164	\$5,989,254
National Aeronautics & Space Administration	\$1,054,641	\$1,260,196	\$1,239,365	\$1,763,527	\$1,835,099
National Science Foundation	\$6,795,488	\$4,380,283	\$4,281,108	\$4,544,590	\$5,195,847
Unknown	\$57,225	\$33,381	\$16,269	\$33,873	\$93,698
Totals	\$13,691,081	\$11,271,798	\$10,689,396	\$12,003,505	\$15,958,670

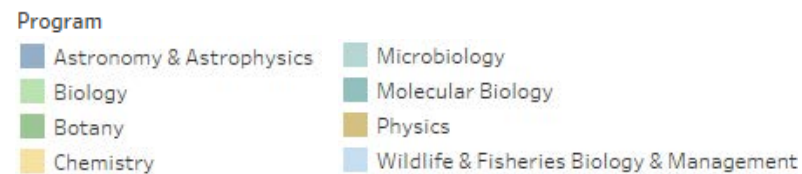
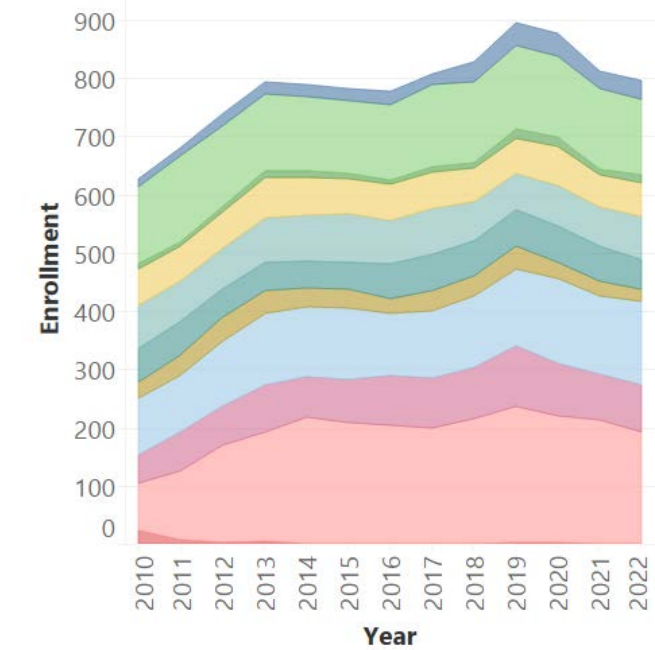
GOALS & METRICS

ENROLLMENT AND DEGREES AWARDED IN UNDERGRADUATE SCIENCE INITIATIVE PROGRAMS

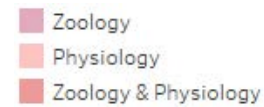
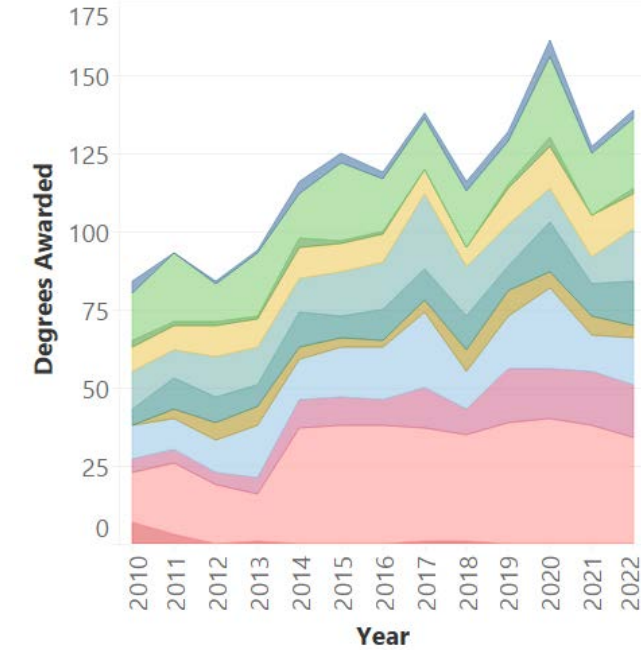
One of the Science Initiative's main goals is to attract, retain, and award degrees to undergraduate students in what have been identified as core science departments and programs at UW, which include Botany, Chemistry, Life Sciences, Microbiology, Molecular Biology, Physics & Astronomy, and Zoology & Physiology. These departments and programs include the following majors: Astronomy & Astrophysics, Biology, Botany, Chemistry, Microbiology, Molecular Biology, Physics, Physiology, Wildlife & Fisheries Biology & Management, and Zoology (Zoology & Physiology were previously one integrated major, but are now split into two).

Enrollment numbers below are based on Fall numbers, and degrees awarded are based on Spring numbers from the same academic year (for example, Fall 2015 enrollment is shown as enrollment for 2016, and degrees awarded in Spring 2016 are shown as degrees awarded for 2016). For the purposes of this data, we can think of the Science Initiative as beginning in 2016 as programming for students began in Fall of 2015.

ENROLLMENT BY SI UNDERGRADUATE PROGRAM



DEGREES AWARDED BY SI UNDERGRADUATE PROGRAM

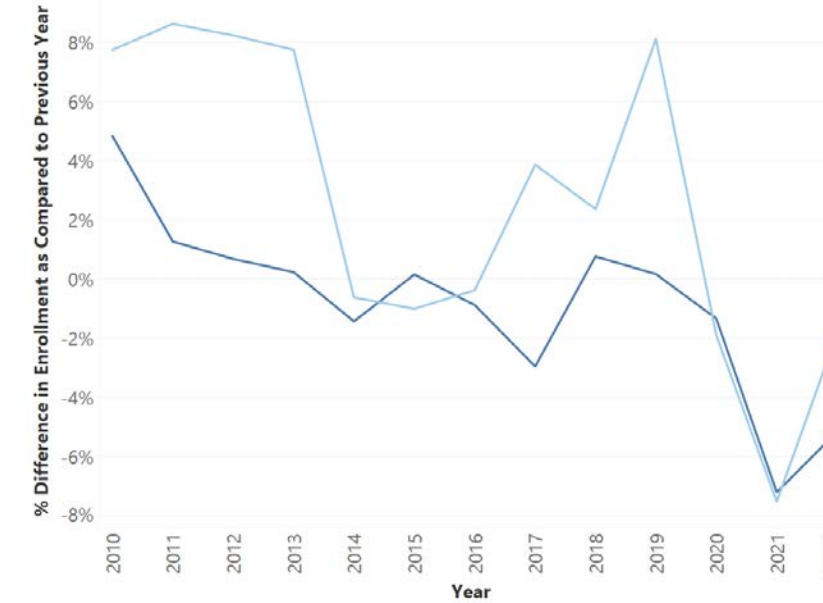


In the period from 2010-2022, UW's total undergraduate enrollment peaked in 2013, after which there was a slow decline, followed by a more pronounced decline in 2021, with the COVID-19 pandemic most likely being the biggest driver. Enrollment in undergraduate SI programs saw 2 periods of growth (2010-2013, 2017-2019) with a plateau between (2014-2016), reaching a peak in 2019. Over 13 years, year over year enrollment change was more positive in 9 years for SI programs than for UW undergraduate programs overall. In 2020 and 2021, however, SI and overall UW undergraduate enrollment change rates mirrored each other (decreasing more sharply), most likely due to the pandemic.

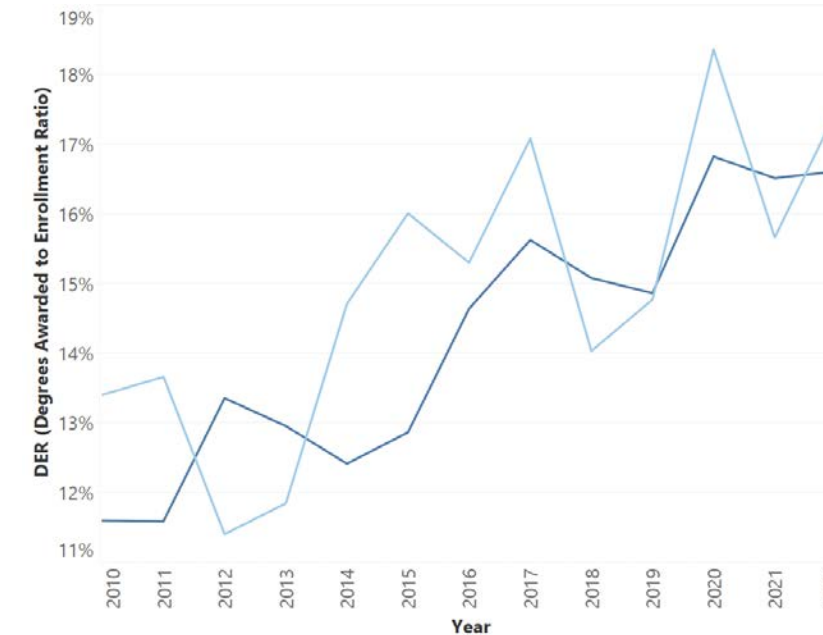
UNDERGRADUATE ENROLLMENT - SI DEPARTMENTS VS UW TOTAL

Program	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
SI Depts Total	627	681	737	794	789	781	778	808	827	894	877	811	796
UW Total	9,523	9,643	9,708	9,730	9,590	9,604	9,519	9,237	9,307	9,322	9,197	8,534	8,093

YEAR OVER YEAR UNDERGRADUATE ENROLLMENT CHANGES - SI DEPARTMENTS VS UW TOTAL



DER (DEGREES AWARDED TO ENROLLMENT RATIO) OVER TIME - SI DEPARTMENTS VS UW TOTAL



To investigate degree completion in SI programs, DER (Degrees Awarded to Enrollment Ratio) data were used instead of 5-year graduation rates, as DER is more inclusive, including transfer and non-traditional students. 5-year graduation rates, as defined by IPEDS, include only the cohort of traditionally-aged, full-time, first-time freshman that have entered college directly after high school. For the purposes of the Science Initiative, we think DER is a better fit as, in Fall of 2021, 37% of UW's new undergraduate enrollees were transfer students. The DER chart shows an increasing trend in the DER for undergraduate degrees overall at UW and for SI programs over the last 13 years. For 8 of those 13 years, the DER of SI programs was higher than that of UW programs overall, for 4 of those 12 years, the DER of UW programs overall was higher than that of SI programs, and for one year, the DER was roughly equal. Since SI program implementation (2016), DER has been higher in SI programs for 4 years, lower for 2 years, and roughly equal for 1 year.

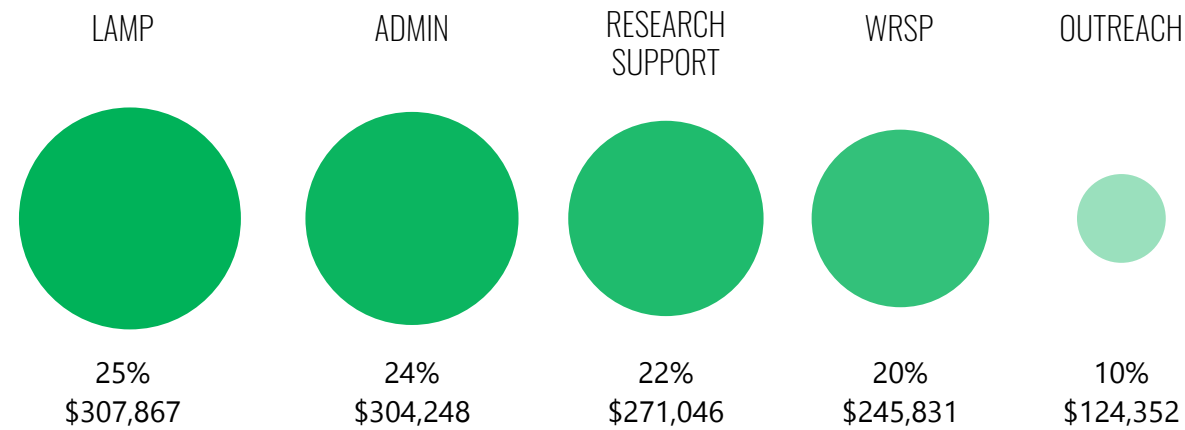
Program implementation is still expanding for both the LAMP and WRSP programs. As SI programs continue to be more fully implemented, the SI plans to continue research on how programmatic elements affect enrollment and degree completion. We do expect that the benefits of all programs will be augmented by the opening of the SI facility as spaces meant to support each of these programs are included.

FINANCIAL STATEMENT

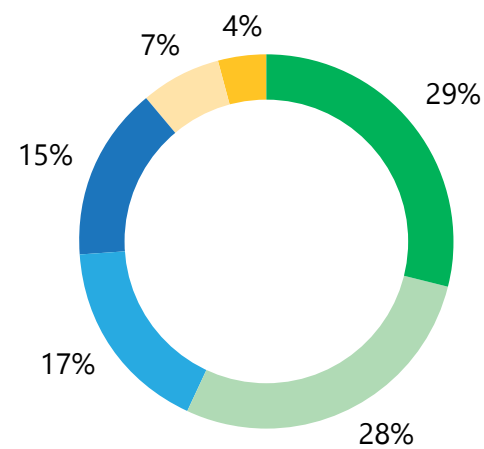
THE PAST YEAR

Our financial goals for the year included continuing to support our active learning and student research programs, increasing outreach to K-12 students and Wyoming communities, and providing seed funding for novel faculty research. We have also continued to work with outside agencies and donors to assist in funding our programming. The Roadshow received a \$5,000 donation from Rocky Mountain Power this year.

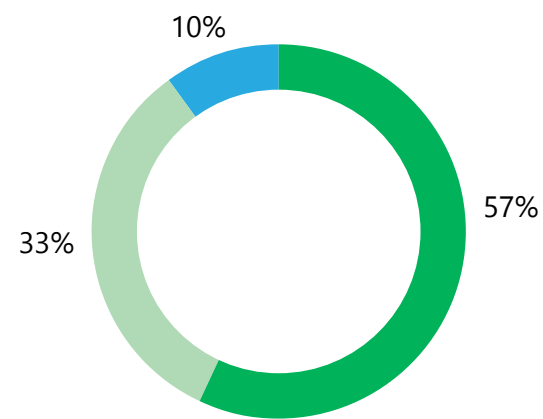
ACTUAL EXPENSES FROM STATE FUNDING (FISCAL YEAR 2021/2022)



RESEARCH EXPENSES BREAKDOWN



TEACHING EXPENSES BREAKDOWN



- Research Facilities
- Graduate Assistant Salaries
- Higher Education
- K-12 Education
- Undergraduate Student Salaries
- Student Tuition & Fees
- Student Training
- Research Supplies & Services
- Research Travel

VISION FOR THE FUTURE

Science Initiative programs are currently supported at **23%** of the full funding outlined in the 2014 Governor's Task Force Report


Fiscal year 2021/2022 budget vs. target budget set by Governor's Task Force and Science Initiative Leadership Team.

BUDGET SEGMENT	TARGET BUDGET	FY 21/22 ALLOCATED BUDGET	REMAINING ALLOCATION NEEDED	PERCENT FUNDED
Active Learning Training Programs (LAMP)	\$398,000	\$324,881	\$73,119	82%
Undergraduate Research Programs (WRSP)	\$900,000	\$368,416	\$531,584	41%
Administrative Staffing and Expenses	\$506,000	\$318,968	\$187,032	63%
Outreach and Engagement	\$200,000	\$14,735	\$185,265	7%
Research Support and Facilitation	\$817,000	\$123,000	\$694,000	15%
Core Instrumentation Facility (CASI) Staffing	\$510,000	\$0	\$510,000	0%
Specialized Building Staffing	\$160,000	\$0	\$160,000	0%
PhD Scholars Program	\$920,000	\$0	\$920,000	0%
Innovative Seed Grants	\$600,000	\$0	\$600,000	0%
Totals	\$5,011,000	\$1,150,000	\$3,861,000	23%

LOOKING AHEAD

Science Initiative programming is primarily funded by a state allocation. The current allocation is \$1.15 Million per year. This figure represents about 23% of the total allocation outlined in the 2014 Science Initiative Governor's Task Force Report. Much of the unfunded programming is planned in conjunction with the new facility and will be revisited in the coming year. In order to expand existing programming given fiscal realities, we are planning to expand our revenue streams to include external and private funding. The plan for revenue diversification includes:

1. Engaging in partnerships with other units to broaden and expand reach
2. Targeting private funding efforts at direct funding of undergraduate students in the WRSP and the LAMP Learning Assistants Program, as well as state outreach efforts
3. Pursuing external funding for emerging programs including outreach programming, course-based research development, & innovative educational advancements



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