MASTER OF SCIENCE IN BIOLOGY

ACADEMIC PROGRAM REVIEW 2025

MEET OUR TEAM

Don Robinson, Ph.D.
Associate Professor
Chair Graduate Committee

Ph.D., Maharishi University of Management, Physiology
M.A., Maharishi International University, Science of Creative Intelligence
M.S., Maharishi International University, Physiology
M.S., The University of Akron, Biology
B.S., Northern Arizona University, Biology

James Tutt
Professor
Dean, School of STEM

M.A., Western New Mexico University

B.S. Fort Lewis College, Chemistry

Shazia Hakim, Ph.D.
Professor

Ph.D., University of Karachi, Microbiology
M.Sc. University of Karachi, Microbiology
B.Sc., University of Karachi, Microbiology

Oleksandr Makeyev, Ph.D.
Associate Professor

Ph.D., Clarkson University, Engineering Science
M.S., Taras Shevchenko National University, Statistics
B.S., Taras Shevchenko Nation University, Mathematics

Demetra Skaltsas, Ph.D.
Associate Professor

Ph.D., University of Maryland, Plant Science
B.S., University of Maryland, Plant Science

MISSION & GOALS

01. Mission

Program Mission Statement

The Master of Science in Biology degree at Diné College is a classic program of thesis research and advanced courses focusing on one of a wide range of disciplines, including molecular, cellular, organismal, and ecological levels of biology. It is designed to promote enhanced knowledge and appreciation of a student's research discipline, the student's life and life on earth, and training that will enable students to succeed in our program, develop a career path, continue their graduate studies, obtain employment and promotion in the workforce, and serve the Navajo Nation.

02. Goals

Program Goals

1. Students will take the core advanced discipline courses for biology to prepare them for a variety of relevant careers, or for further graduate work in biology or related areas.
2. Students will be able to integrate traditional Diné cultural knowledge with the western biological knowledge to improve their level of understanding, and its impact on their communities.
3. Students will understand the importance of graduate work, research, and leadership, relevant to their advancement in the field of biology and knowledge in general.
4. Students will familiarize themselves with the biologically-related problems on the Navajo Nation

Overview Data Summary

	Fall 2020	Fall 2021	Fall 2022	Fall 2023	Fall 2024
Graduate student Headcount	**Program started Fall 2022*		4	8	11
Total Student Full-time Enrollment			4	5	11
Total Student Part-time Enrollment (Honors Scholars)			0	3	6
Total Students that graduated (fall & spring)			0	0	3
			Fall 2022	**Fall 2023**	**Fall 2024**
# of students in cohort			**4**	**4**	**3**
Persistence Trend (fall to spring)			100%	100%	100%
Retention Trend			100%	100%	100%
Graduation Rate 6 year from 2018 Cohort – None					

Following a Cohort of students from 2018 over the course of six years, ALL programs at the institution have a 7% chance of students declaring a major and graduating with the major.

There have been 21 students enrolled in the MS Biology program since its inception in Fall, 2022. Only one student has dropped out of the program since the beginning, but rejoined the program after two years. Three students (Faylene, Kaitlan, Neilroy) received their MS Biology degree in December, 2024, after 2.5 years attendance. Two students (Alana and Harrison) received their MS Biology degree in May, 2025, both after 3 years of attendance. Alana received her BS and MS degree at the same time.

ID#	Student	Mentor	Campus	Graduating	Program	Email
95641	Begay, Jessica	Demetra	Tsaile		MS-Biology	jessbegay@dinecollege.edu
97758	Jacobson, Sedona A.	Demetra	Tsaile	[1]Yes	*BS-Agr	sedonaj1@gmail.com
90553	John, Lavine D.	Demetra	Tsaile		MS-Biology	lajohn@dinecollege.edu
10417	Mares, Marissa	Demetra	Tsaile		MS-Biology	mmares@dinecollege.edu
92944	Tsosie, Tyhanin	Demetra	Tsaile	Yes	BS-Agr	tyhatsosie@dinecollege.edu
96154	Cleveland, Erin	Demetra	Tsaile		MS-Biology	ecleveland@dinecollege.edu
94831	Bia, Cauy S.	Demetra	Tsaile	Yes	BS-Agr	cauybia@dinecollege.edu
89473	Clyde, Chantanielle	Don	Tsaile		MS-Biology	csclyde@dinecollege.edu
89473	Alana Benally	Oleksandr	Tsaile	Spring 2025	BS-Biomed & MS-Biology	alanalee@dinecollege.edu
83562	Sheldon Chee	Oleksandr	Tsaile		BS Biomedical	snchee@dinecollege.edu
94720	Nez Ian	Shazia	Tuba City		MS-Biology	ianez@dinecollege.edu
79280	Wheeler Dorothea	Shazia	Tuba City		MS-Biology	drwheeler@dinecollege.edu
98160	Piestewa Karlene	Shazia	Tuba City		MS-Biology	krpiestewa@dinecollege.edu
93497	Harrison Cayatineto	Shazia	Tuba City	Spring 2025	MS-Biology	hcayatineto@dinecollege.edu
105175	Chicharello, Vanessa	Shazia	Tuba City		MS-Biology	vamchicharello@dinecollege.edu
96719	Joyceline Greymountain	Shazia	Tuba City		MS-Biology	jswero@dinecollege.edu
	Jeriah Boyd - H	Shazia	Tuba City		BS Biomedical	jeriahboyd@dinecollege.edu
93757	Maya Begay	Shazia	Tuba City		BS Biomedical	maybegay@dinecollege.edu
	Kaitlan James	Shazia	Tuba City	Fall 2024	MS-Biology	kaitlanjames@dinecollege.edu
	Neilroy Singer	Shazia	Tuba City	Fall 2024	MS-Biology	nsinger@dinecollege.edu
	Faylene Begay	Shazia	Tuba City	Fall 2024	MS-Biology	faybegay@dinecollege.edu

DEGREE PROGRAM OVERVIEW

The Master of Science in Biology program will develop student's knowledge and research skills in an area of laboratory and/or field research in the biological sciences available at Diné College. The program will prepare students to pursue careers in the biological and related science areas, as well as continued graduate and/or professional medical education.

CURRICULUM

In the first year of the two-year graduate program, students will take two Orientation to Graduate Research courses, BIO 501 and NAS 513, 3 hours each, consisting of advanced concepts in experimental design and statistical analysis, grant writing, ethical conduct of research, and publishing papers. Specialty independent study lab "seminar" courses (BIO 698, 2-3 hrs) and graduate level background courses will also be taken. The student's Graduate Committee is assembled from graduate faculty in the discipline area of the student's research and an external research faculty from an outside research university or industry. The Graduate Committee is responsible for the two-year plan and timeline for graduation. Students will begin their thesis research the first semester.

As determined by student's graduate committee:
Semester I
BIO 501 Design of Experiments & Analysis of Data 3
BIO 698 Lab Seminar 2-3
Elective (500-699 Course) 3
Credits: 8-9

Semester II
NAS 513 Indigenous Research Methodology 3
BIO 698 Lab Seminar 2-3
Elective (500-699 Course) 3
Credits: 8-9

Semester III
BIO 699 Thesis Research 3
BIO 698 Lab Seminar 2-3
Elective (500-699 Course) 3
Program Credits: 8-9

Semester IV
BIO 699 Thesis Research 3
BIO 698 Lab Seminar 2-3
Semester IV Credits
Elective (500-699 Course) 3
Program Credits: 8-9

Total Credits: 32-36

Student	Mentor	Thesis research title
Begay, Jessica	Demetra	Endophyte genetics
Jacobson, Sedona A.	Demetra	Studying contaminants and the fungal communities of Navajo Tea in remote areas versus heavily trafficked areas
John, Lavine D.	Demetra	Endophyte genetics
Mares, Marissa	Demetra	Uranium remediation
Tsosie, TyHanin	Demetra	Investigating juniper endophytes under managed and non-managed forests
Cleveland, Erin	Demetra	Endophyte genetics
Bia, Cauy S.	Demetra	Researching fungi associated with pinyon decline
Clyde, Chantanielle	Don	Monitoring Academic Progress and Health in Indigenous Students Practicing Transcendental Meditation
Alana Benally	Oleksandr	Assessing the importance of optimal Laplacian estimation coefficients for commercially available concentric ring electrodes on human data and via finite element method modeling
Sheldon Chee	Oleksandr	EEG electrode design
Nez Ian	Shazia	Microbiology genetics
Wheeler Dorothea	Shazia	Microbiology genetics
Piestewa Karlene	Shazia	Diabetes-Related Amputation Prevention and Foot Care in Navajo Communities: an Ongoing Study
Harrison Cayatineto	Shazia	A Potential microRNA-Based Inhibitor against the Nucleocapsid Gene and/or Capsid Gene in Bovine Viral Diarrhea Virus: A Surrogate Model for Hepacivirus and Flaviviruses
Chicharello, Vanessa	Shazia	Human Chorionic Gonadotropin (hCG), Cancer and Indigenous Communities
Joyceline Greymountain	Shazia	Medicinally Significant Species of Yucca schidigera and their Antimicrobial and Anti-inflammatory Properties
Jeriah Boyd	Shazia	Microbiology genetics
Maya Begay	Shazia	Microbiology genetics
Kaitlan James	Shazia	Soil Analysis from Navajo Reservation in Search of Novel Antibiotics
Neilroy Singer	Shazia	Restoring Natural Water to Potable Quality in Off-Grid Areas on Navajo Nation
Faylene Begay	Shazia	Antimicrobial effect of Ts'ah Tsoh or Sage (Artemisia tridentata) against Candida albicans, E. coli and Staphylococcus aureus Spp.

DINÉ IDENTITY & PROGRAM UNIQUENESS

During the accreditation period of application for acceptance, both NSF and Dine' College academic administration required a thorough explanation about how Dine' culture and language will be incorporated into the program for the students. At that time, a series of meetings was convened for discussions with the Dine' Studies faculty, STEM faculty, and Executive Council (School Deans, Provost, Institutional Vice Presidents, and President). After two weeks and several meetings, a consensus document was accepted by both Dine' College and the NSF TCUP grant directors. This document is included in the appendix. Some specific actions outlined are as follows:

1. Students take NAS 513 Indigenous Research Methodology (3) which helps integrate Dine' language, culture, and especially ways of thinking with research in their research area.
2. Faculty mentors encourage student's exploration of their culture and language related to their research. Finding these relationships is required content in the student's Thesis document.
3. To encourage exploration of relevant relationships between the student's research area and Dine' knowledge, each of the student's Graduate Committee is required to have one Dine' cultural expert on the Committee, who mentors and oversees the student's thinking and writing about the Dine' relationships with their research. In some cases, traditional ceremonies are required to be done to allay negative influences that may be caused by the student's research. Various do's and don'ts are explained to the student and research mentors to protect them from harmful influences that may be caused by the research activities.

INSTRUCTION METHODS

In Tsaile there are dorms, for both single students and families, and there is a cafeteria, support services like computer labs and library, and recreation facilities. As mentioned, three graduate mentors teach from Tsaile. In Tuba City, Dr. Hakim has a majority of graduate students but there are no housing or dining or support facilities except a learning center. Still, students travel to the labs and stay in hotels if necessary. This is not ideal but the MS Biology grant helps finance this travel. In the future there is planning for dorms and cafeteria in Tuba and in Shiprock.

The MS Biology program activities, courses and research, are carried out at various locations where the mentor and/or student reside. Dr. Hakim is in Tuba City, and the other three researchers are in Tsaile. Shiprock also has labs that are in use by graduate students. There may be elements of some courses that can occur online, via Zoom lectures for instance, but most work and education is done in labs or in the field.

ASSESSMENT OF STUDENT LEARNING OUTCOMES

Considering that our first three graduates occurred in December, 2024, and our Program Assessment largely involves the student's Thesis document, we are just beginning the process of doing our first program assessment. For this first academic year under new management of our Program Assessment, we are required to assess PSLO #1. This Exit Survey is being given to our first three graduates from December, and our upcoming graduates in May. The rubric for this will be student fulfillment of understanding PSLO #1 criteria after all semesters of their program, with 4=excellent knowledge, 3=very good knowledge, 2=good knowledge, 1=not enough knowledge taught and understood.

Outcome #1 Elucidate the major theories, research methods, approaches to inquiry and schools of practice in their biological discipline illustrating both the applications and relationships to other life sciences and biological disciplines.

BIO 500-604
Special topics electives

Artifact is Exit Survey indicating what was learned in these four courses

PROGRAM FACULTY

PROGRAM FACULTY PROFILE

	2020-21	2021-22	2022-23	2023-24
Total Program Faculty/Instructors			**4**	**5**
Full-Time Faculty			4	5
Education (PhD, MA, BA)			All Ph.D.	All Ph.D.
Rank			1As P, 2Ac P, 1 P	1As P, 2Ac P, 1 P
Adjunct Faculty			0	0
Gender (Female/Male)			2/2	3/2
Race/Ethnic (Native/Non-Native)			All N-N	All N-N
Salary Range				
	2020-21	**2021-22**	**2022-23**	**2023-24**
Total Program Faculty/Instructors			**4**	**5**

STUDENT TO FACULTY RATIO

	2020-21	2021-22	2022-23	2023-24
Average Student to Faculty Ratio			5:1	5:1

REFLECTION ON FACULTY MANAGEMENT, CONTRIBUTION & EVALUATION

Strengths: students are happy with their research and classes and are successful with their movement through the degree program. Faculty enjoy the College and the School of STEM overall, and the support we receive from grants, our fellow graduate faculty, our Dean and higher administration at the College. One point of interest is the President has been pointing out to us that the graduate program is not funded in the same way that the undergraduate programs are. Therefore, we are constantly assuring him and others that our graduate program can be sustained by our research grants. Currently there is an opportunity to increase funding from Congress for Dine' College at the graduate level. We are hopeful this promotion succeeds.

Opportunities to improve: Faculty are always improving their teaching, their lab activities, their research involvement. There seems to be a consensus that not all faculty are collegially close but we manage to get along enough, although it could be better through more collegial behavior towards each other, and more regular and substantial communications. This is a theme of development in our School of STEM for all programs. We feel encouraged to participate.

STUDENT PROFILE

STUDENT PROFILE OVERVIEW

Chapter	Total # of students enrolled
Lukachukai	2
Coalmine Mesa	1
Pinon	1
Klagetoh	1
Tuba City	4
Chinle	1
Crown Point, NM	1
Shiprock, NM	1
Gallup, NM	1

	2020-21	2021-22	2022-23	2023-24
Full-Time Students, includes fall, spring and summer terms	*Program started Fall 2022		4	9
First Time First Year Enrollees			4	5
Transfer Students			0	1
Pell Grant Recipient – at least one term			4	8
Gender = F/M			2/2	5/4
Race/Ethnic = Native/Non-Native			4/0	9/0
Age Range:				
13-17	*Program started Fall 2022		0	0
18-21			0	0
22-24			0	0
25-34			2	6
35-49			1	2
50 & Older			1	1

STUDENT ENGAGEMENT & LEARNING OPPORTUNITIES

COMMUNITY ENGAGEMENT

Community Engagement

There are many community engagement activities between high schools, business communities, and community organizations, including Chapter Houses, with the different research groups in the MS Biology program, and with most research activities at the College. The research programs particularly supports community engagement activities for the students to participate in. This is an important part of Dine' College education, to work with local communities and teach students how to participate in community outreach.

HIGH IMPACT PRACTICES

The entire MS Biology program is designed to be “high impact” for all parties concerned. For the College, a graduate education program is boosting overall learning and achievement to a higher level. For the local communities, they see a significant and mature educational programming coming from the College, with the students, their families and the communities as beneficiaries. For the students and their families, the MS Biology program allows students to get a graduate education on the Reservation, close to their homes, at reduced cost and burden of moving. For the Reservation and communities, the research activities help understand the important local issues such as health and the environment.

CO-CURRICULAR

Library Services

We have an excellent library with the largest selection of books and periodicals in the area. We have faculty-level expert librarians that assist students, Instructors and courses from freshman to graduate students. The library was remodeled in 2018 to increase study rooms and carrels. We have a free service to graduate students to find and deliver scientific papers to them in a timely way.

Student Success Services

We have computer science, math, chemistry and English tutors available to our students throughout Student Services. There are a lot of cultural and intellectual and artistic and entertainment presentations almost on a daily basis available to all students and the College community. Student Services provides a rich co-curricular variety of activities and services that seem to only increase and improve over time. Cafeteria and Starbucks Café offer meals year-round for the most part. Dorms and family housing have kitchens. Tuba and Shiprock have ample fast food options in town. It has been difficult in general moving the College into the graduate student arena. One example is dormitory use. Since graduate students work year-round, dorms have to be open for them. After 3 years I think they are starting to get used to this idea.

COURSE SATISFACTION & GRADUATION SURVEY

Course Satisfaction

As indicated above in the Assessment report, we are now beginning to do course and program assessment since these are based mostly on thesis completion. The first year we required students to take BIO 503, Elements of Scientific Endeavor, but along with typical content such as paper writing skills there was a significant section on Navajo Research Methods. After this course it was felt that more time was needed for Navajo Research Methods, and NAS 513 was selected to take the place of BIO 503. The first year this was offered, in Fall of 2024, the course was very difficult for Honor Scholars because their research was not developed enough to take advantage of the course knowledge. After that it was recommended that only graduate students, and even second year students, should take that course, unless a student was recommended by graduate faculty to take the course if they were Honors Scholars.

Graduation Survey

PSLO #1 is currently being assessed for our December, 2024 and May, 2025 graduates.

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PROGRAM RESOURCES

FACILITIES & OPERATING BUDGET

Three graduate faculty have labs devoted to their graduate research that their students work in.
Another faculty (DR) does not require specialized space for his student's research.
Number of classrooms, science labs used by all STEM students:

- Tsaile: 4 lab classrooms, 2 for biology, 1 for chemistry, 1 for environmental science
- Shiprock has biology and chemistry classrooms in a new Math Science building.
- Tuba City has one science lab classroom and two labs for research and training, one molecular biology and one biochemistry.

Administrative offices are on all campuses. All faculty have their own offices.
Digital databases for academic use, computer labs, conference rooms, and other equipment. We have a computer science lab classroom in Tsaile. There are several computer student learning centers, one at each campus. The College in Tsaile had a large auditorium until the Student Union fire, but also has a recently renovated large auditorium classroom in the Ned Hatathlie Center (NHC).
The STEM School and the College are responsible for all of our faculties, as well as grants from graduate faculty. It should be noted that indirect from grant money helps with this as well.

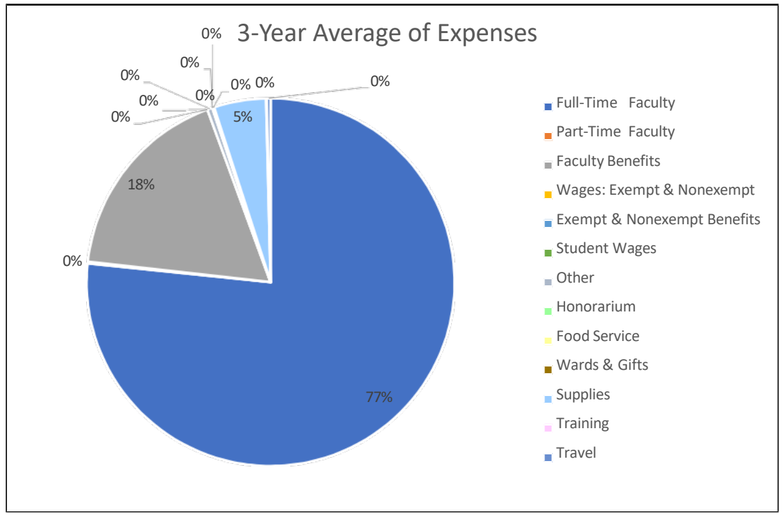
Operating Budget
Costs are from infrastructure maintenance such as utilities and repair, and also renovation in some cases of lab spaces requiring structures such as sinks, cabinets, tables, chairs, etc. Faculty and staff salaries are costs. Supplies and equipment for labs are paid for by grants as much as possible, but STEM College finances anything that is not related to grant objectives. Graduate faculty have research grants that are used in part for most of these kinds of these costs.

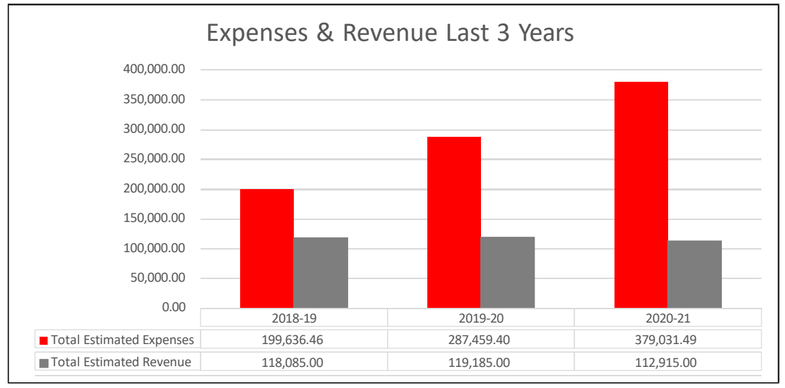
Personnel Expenses	BIO 2018-19	2019-20	2020-21
Full- Time Faculty	$151,591.29	$216,871.41	$295,609.78
Part-Time Faculty	$0.00	$0.00	$1,435.65
Faculty Fringe Benefits	$35,801.96	$53,331.44	$63,640.51
Wages: Exempt	$0.00	$0.00	$0.00
Wages: Non Exempt	$0.00	$0.00	$0.00
Fringe Benefits: Exempt			
Fringe Benefits: Nonexempt	$0.00	$0.00	$0.00
Wages: Students	$0.00	$0.00	$0.00
Total Personnel Expenses	$187,393.25	$270,202.85	$360,685.94

Other Expenses	BIO 2018-19	2019-20	2020-21
Advertising/Promotion			
Contract: Honorarium	$0.00	$0.00	-$300.00
Food Service			
Awards & Gifts	$625.00	$0.00	$600.00
R & M: Equipment	$0.00	$3,665.00	$0.00
R & M: Other	$115.81	$0.00	$0.00
Rental: Equipment			
Scholarship: Fee Remission			
Supplies: Dues/Subscription	$300.00	$734.00	$1,422.18
Supplies: Instructional	$9,729.60	$11,766.51	$15,577.18
Supplies: Office	$135.05	$0.00	$0.00
Supplies: Operating			
Supplies: Postage/Freight	$11.25	$0.00	$0.00
Supplies: Printing/Binding	$0.00	$52.00	$0.00
Training: Seminar Fees	$0.00	$0.00	$524.19
Travel Expense	$1,210.65	$902.63	$522.00
Travel: Assigned Vehicle	$115.85	$136.41	$0.00
Vacancy Advertisement			
Total Other Expenses	12243.21	17256.55	18345.55

Revenue	BIO 2018-19	2019-20	2020-21
Course/Lab/Program fee			
State Grants			
Federal Grants			
Course Enrollments	551	561	520
Student Credit Hours (SCH)	2147	2167	2053
Tuition Rate	55	55	55
Estimated Revenue based on SCH	$118,085.00	$119,185.00	$112,915.00
Total Revenue	$118,085.00	$119,185.00	$112,915.00

	BIO 2018-19	2019-20	2020-21
Total Estimated Expenses	199,636.46	287,459.40	379,031.49
Total Estimated Revenue	118,085.00	119,185.00	112,915.00
Est. Revenue minus Est. Expense	-81,551.46	-168,274.40	-266,116.49
Ratio (Revenue / Expense)	0.59150017	0.414615073	0.297904008





Notes:
2024-25 "Other Expenses" amount is approx. $43,000. Other Expenses money comes from lapsed salary funds – salary not used before going back into General Fund at end of academic year.

Salary amounts are totals from faculty based on BIO courses taught. The amount is from the faculty's contract and does not include the percent paid by the faculty's grants.

"Revenue" does not include grant money spent on Personnel and Other Expenses.

"STEM 2020" NSF grant, 2015-2022, was a 2.5 million grant paying for 3 faculty positions (1 was biology), student wages (2 were bio lab assistants, and 15 summer biology research interns each summer) and Other Expenses

MS Biology Grant Support

MS Biology Grant, 2023-2028, NSF TCUP (Tribal College and University Program), 2.5 Million
PI. Don Robinson
Supports:
Development, accreditation, implementation of MS Biology program
Senior Personnel: Dr. Shazia Hakim and Dr. Demetra Skaltsas, Salary (10-20%), Research Equipment and Supplies
Administrative Assistant (50%)
7 Biology Faculty Salaries (10% year 1) and lab start up funds
Graduate Student research internship wages, part-time 9 months, full-time summer months
Student and faculty conference travel

DOD equipment grants received by two graduate faculties Dr. Hakim ($700,587)and Dr. Skaltsas ($400,000) support purchase of many state of the art equipment including GridION Gene sequencer, Sanger, CytoFlex, and IMF Microscopes etc. to support graduate research

All of Us Researcher's Academy Institutional Champion Award received by Dr. Hakim is currently supporting for of her graduate students to access All of Us Research Workbench data, program software and stipend for their graduate research

Water is Life Grant, 2021-2026, NSF TCUP, 3.5 Million
P.I. Don Robinson
Supports Water Research for 6 faculty, 3 research staff, student lab assistants.
Purchase of analytical chemistry equipment, gene sequencers, environmental sensors
Objectives include Reservation water testing for organisms and heavy metal contaminants (wells, rivers) for reporting/tracking/restoring; water purification filter development for residential and larger-scale use; Reservation mountain watershed tracking of ecology linkages with climate change-related precipitation patterns.

THANK YOU!

Questions?