ACADEMIC PROGRAM REVIEW SELF-STUDY CRITERIA

Master of Science in Biology

A. Executive Summary

The executive summary provides a high-level overview of the program: history, mission, goals, alignment to the institution, student and community demand, and a data summary of student enrollment, faculty, graduation rate, retention trend and time to completion.

- Please provide a brief description on the history of the degree program including when it was first created, who were the key parties involved in its creation, and why it was initially introduced to Diné College.
    - The MS Biology program is the first Masters-level program at Dine' College. It was always part of the "plan" in the Science Department, led by Chair Don Robinson in 2014, when a large NSF TCUP grant was being written to start three BS degrees in the Science Department. After the grant was funded and the BS programs begun, MS Biology program ideas began to be discussed. This was officially sanctioned by President George around 2015-16. Science Faculty began to meet regularly to plan, and another large NSF TCUP grant proposal was begun to fund the program. The first grant proposal in 2019 was turned down. Further planning by science faculty continued and a second proposal was submitted and then accepted for funding in Spring of 2022. Because most of the preparations and approvals for the program were already underway or finished at the level of the College and also with the HLC (Higher Learning Commission), the first class was able to begin in the Fall of 2022.
- Briefly describe
    - **The Program's Mission/Goals and how it aligns with the Institution's Mission (**from https://dinportal.jenzabarcloud.com/ICS/Faculty__Staff/Office_of_the_Provost/Office_of_Assessment/Degree_Program_Assessment/MSBiology/)

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.

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

as it relates to their community, and how they can contribute to resolving these issues through their graduate studies and research.

- Briefly describe the **College Mission**

Diné bina'nitin t'áá íiyisíí á siláago binahjį', ołta'í na'nitin náasjį' yee ínááhwiidooł'áłígíí yéego bidziilgo ádiilníiłł, áko Diné nilínígíí t'áá ałtso yá'át'éehgo bee bił nahaz'áa dooleeł niidzin.

Rooted in Diné language and culture, our mission is to advance quality post-secondary student learning and development to ensure the well-being of the Diné People.

Alignment of the MS Biology program with the College Mission
Full alignment when comparing College Mission with Program Mission

- Briefly describe the **Institution's Strategic Goals**

Diné College's strategic goals center on serving the Navajo Nation through education, culture, research, and innovation. They aim to enhance quality education, expand access to Navajo language and culture, support research initiatives, and strengthen the institution's capacity to meet the evolving needs of the Navajo community.
Here's a more detailed look at the strategic goals:

- **Quality Growth for Navajo People:**

  This goal focuses on providing quality education and resources to students and the community, ensuring sustainability, diversity, equity, and inclusivity.

- **Language & Culture:**

  Diné College seeks to increase the accessibility and appreciation of the Navajo language and culture within and beyond the Navajo Nation through innovative programs.

- **Research:**

  The college aims to support faculty, staff, and students in conducting research that aligns with tribal values, enhances research capacity, and advances the institution's research agenda.

- **Teaching and Learning:**

  Diné College focuses on building human capacity within the Navajo Nation through undergraduate and graduate programs, certificates, continuing education, and specialized training.

Alignment of the MS Biology program with the College Strategic Goals
Full alignment when comparing College Strategic Goals with Program Goals

- Briefly describe the **College's Educational Philosophy**.

Diné College's educational philosophy, rooted in "Sa'ah Naagháí Bik'eh Hózho'o'n," emphasizes harmony with the natural world and the universe. This philosophy, which is central to the Navajo traditional living system, guides the college's mission by fostering well-being, protection from imperfections, and a holistic development of students, incorporating Navajo cultural traditions and values.
Key aspects of Diné College's educational philosophy:

- **Sa'ah Naagháí Bik'eh Hózho'o'n:**

  This traditional Diné way of living emphasizes harmony with the natural world and the universe, providing principles for both protection and well-being.

□ □ **Harmony with Nature:**
The philosophy is grounded in the natural processes of the four cardinal directions, daily cycles, and seasonal changes, reflecting the Diné worldview.
□ □ **Nitsáhákees (Thinking):**
Students are encouraged to apply reasoning, analyze problems, and develop creative solutions.
□ □ **Nahat'á (Planning):**
Emphasis on developing communication, systematic organization, and planning skills.
□ □ **Iiná (Implementation):**
Students are encouraged to demonstrate self-direction based on personal values and quality work.
□ □ **Siihasin (Reflection and Assurance):**
Students are guided to reflect on their learning, demonstrate competency, and gain confidence.
□ □ **Diné Cultural Traditions:**
The philosophy incorporates Navajo cultural values and teachings, ensuring that students are prepared to contribute to the social, economic, and cultural well-being of the Navajo Nation.
□ □ **Holistic Development:**
Diné College aims to foster not only intellectual growth but also the development of the whole person, including their spiritual, emotional, and social aspects.

In essence, Diné College's educational philosophy aims to equip students with the knowledge, skills, and values necessary to thrive in a world that respects both the natural world and their own cultural heritage.

Alignment of the MS Biology program with the College Educational Philosophy
Full alignment when comparing our Program Mission and Goals with College Education Philosophy.

- Please provide a brief description on the purpose of the degree program such as meeting the needs of the community, the Navajo Nation, or the student demands for the program.

From the MS Biology Grant Proposal, 2022: Broader Impacts: This Masters of Science in Biology degree at Diné College will improve the lives of the students, their families and their communities because of the improved employment and educational opportunities the graduates will have. Diné College will advance to higher levels of educational offerings. As we have seen with the creation of Bachelor degrees at the College, the students and faculty rise to higher levels of functioning intellectually in their disciplines, and in their academic and research achievements. The incorporation of Traditional Ecological Knowledge into the graduate studies allows Navajo students at the graduate level to understand the broader implications of their deeper and wide-ranging knowledge on their cultural values, life in their Navajo communities, and

indigenous values. The program will be further designed to graduate student's debt-free, counseled for employment or further graduate or professional study.

- Provide an overview of the program's full-time and part-time enrollment, number of degrees awarded, full-time faculty, adjunct faculty, graduation rate, retention rate, and time to completion rate over the last four academic years.
    - There are only full-time students in the MS Biology program and in the MS Biology Honors Scholars undergraduate BS programs.
    - 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) will receive their MS Biology degree in May, 2025, both after 3 years of attendance. Alana will receive her BS and MS degree at the same time.
    - There are four full time graduate faculty with graduate students:
        - Demetra Skaltsas, Ph.D., Assistant Professor
        - Don Robinson, Ph.D., Associate Professor
        - Oleksandr Makeyev, Ph.D., Associate Professor
        - Shazia Hakim, Ph.D., Professor

Additionally, Christine Ami, Ph.D., Associate Professor, teaches a required graduate course, NAS 513 Indigenous Research Methodology (3).

Table 1: Overview Data Summary

	Fall 2020	**Fall 2021**	**Fall 2022**	**Fall 2023**	**Fall 2023**
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 2023**
# 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					

Table 2: MS Students, graduated, current, and Honors Scholars.

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	[2]Yes	BS-Biomed & MS-Biol	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	Yes	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

*BS degree-seeking students are designated Honors Scholars, with tentative acceptance into the MS Biology program to take courses and receive research internships. Upon graduation they enroll in the MS program full time.

[1]Graduating in May 2025 as Honors Scholar with BS degree

[2]Graduating in May 2025 with MS Biology

B. Self-Study Summary

Short description of what academic years the review covers, names of individuals contributing to the APR. Indicate when the last time this program was reviewed and what has changed since the last APR.

i. The data tables provided to us from our Office of Institutional Planning and Reporting (OIPR) list data from Fall 2020 to Fall 2023. However, our program began in the Fall, 2022, so only two years of data are in these tables, even though we have been operating from Fall 2022 to current. Therefore, we are commenting on three academic years, with 2024-2025 data not coming from the tables. All four graduate faculty will be reviewing this APR document. Robinson (main writer), Makeyev, Hakim, Skaltsas.

C. Degree Program Overview

In the Degree Program Description of the Self-Study Report, Schools will provide information pertaining to the degree program curriculum, Diné Identity and Program Uniqueness, instruction delivery methods (modality and locations), program faculty and aspects of student learning.

C.1. Curriculum

- Please provide a comprehensive description of the curricula for the degree program including a list of required courses, general education courses, and electives, as well as an analysis of course progression and academic rigor. Include how and where the courses are offered, and a review of course prefixes, course prerequisites, course descriptions and credit hours as listed in the catalog.

From the 2024-2025 Catalog:

MASTER OF SCIENCE DEGREE PROGRAM
Master of Science in Biology (M.S.)
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. 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.

Semester I Credits
BIO 501 Design of Experiments & Analysis of Data 3
BIO 698 Lab Seminar 2-3

Elective (500-699 Course) 3
as determined by student's graduate committee
Program Credits: 8-9

Semester II Credits
NAS 513 Indigenous Research Methodology 3
BIO 698 Lab Seminar 2-3
Elective (500-699 Course) 3
as determined by student's graduate committee
Program Credits: 8-9

Semester III Credits
BIO 699 Thesis Research 3
BIO 698 Lab Seminar 2-3
Elective (500-699 Course) 3
as determined by student's graduate committee
Program Credits: 8-9

Semester IV Credits
BIO 699 Thesis Research 3
BIO 698 Lab Seminar 2-3
Semester IV Credits
Elective (500-699 Course) 3
as determined by student's graduate committee
Program Credits: 8-9

Total Credits: 32-36

Financial Aid Available:
Students are required to apply for all possible scholarship opportunities, which include ONNSFA (Office of Navajo Nation Scholarship and Financial Aid) and American Indian College Fund (AICF). In most cases students are eligible for ONNSFA full scholarships for their entire graduate education. In addition, all students receive part time research internship pay from the NSF TCUP MS Biology grant (2022-2027), P.I. Don Robinson, a 2.5 million award for graduate internship pay, lab supplies and equipment for two faculty and their students, start-up funds (32K each) for 8 potential graduate faculty and students, conference travel, intercampus travel, administrative assistance staff. Students pay for their room and board, books and additional costs with their internship pay. It is expected that graduate faculty's research grants will support their student's research when the grant expires. Currently, all graduate faculty have research grants that they use to additionally support aspects of their student's research, including equipment, supplies, student travel and conference support.

Note: Accompanying this MS Biology APR will be the MS Biology Graduate Handbook, and the MS Biology Brochure, used to advertise the program. These will be sent to External Reviewers with the MS Biology APR document.

Table 3, MS Biology Student Checklist

2024 - 2025 Advisement Checklist				
Master of Science				
Biology (32 - 36 credits)				STUDENT: ID #:
				Thesis Advisor:
Date of Thesis Defense:				Thesis Committee Member:
				Thesis Committee Member:
				Thesis Committee Member:
Date Degree Conferred:				
Course No & Title	**Credit**	**Transfer**	**Grade**	
PROGRAM REQUIREMENTS				
Semester I				
BIO 501 Design of Experiments & Analysis of Data:	3.0			
BIO 698 Lab Seminar	2.0-3.0			
Elective (500-699 course)	3.0			
as determined by student's graduate committee		***8 - 9 hrs***		
Semester II				
NAS 513 Indigenous Research Methodology	3.0			
BIO 698 Lab Seminar	2.0-3.0			
Elective (500-699 course)	3.0			
as determined by student's graduate committee		***8 - 9 hrs***		
Semester III				
BIO 699 Thesis Research	3.0			
BIO 698 Lab Seminar	2.0-3.0			
Elective (500-699 course)	3.0			
as determined by student's graduate committee		***8 - 9 hrs***		
Semester IV				
BIO 699 Thesis Research	3.0			
BIO 698 Lab Seminar	2.0-3.0			
Elective (500-699 course)	3.0			
as determined by student's graduate committee		***8 - 9 hrs***		
		Program Credits: 32-36 hrs		
Advisor Signature:_____				
Date Signed:_____				**FINAL: 040324**
MUST pass all above courses with "C" grade or better				

Table 4: MS Biology student's thesis research title.

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*.

MS Biology Courses and Descriptions

BIO 501 Design of Experiments and Analysis of Data (3)
Prerequisite: MTH 213/PSY 213 or similar or instructor permission.
Modern techniques for the analysis of data and for the planning of experiments in research and in manufacturing. Includes use of software to design factorial and response surface method experiments, interpret the results, and fit data to equations.

BIO 503 Elements of Scientific Endeavor (3)
This course is designed for first-year graduate students in Biological Sciences. Student will develop core competencies to aid in professional development. Assigned readings and discussion will cover a range of topics including, writing a research prospectus and/or short grants, presenting research ideas, ethical conduct of research, reviewing and publishing papers, student-advisor interactions, graduate committees, authorship issues, collaborations and mentoring, speaking with the media, outreach, graphic design, data curation, and career development. Letter grade only.

BIO 511 Fungal Biology (3)
Systematics, physiology, ecology, and medical importance of fungi and related forms. Letter grade only.

BIO 518 Advanced Cellular and Molecular Biology (3)
This course will develop and understanding of the key concepts of the molecular biology of the cell, integrating principles of cell structure and function with the underlying molecular mechanism(s). Discussion will focus on aspects of gene regulation, genomics, cell cycle control, protein synthesis, intra-cellular protein trafficking and protein degradation in eukaryotic cells. Many of these concepts will be discussed in the context of how defects in cellular processes give rise to disease. Letter grade only.

BIO 533 Medical Virology (3)
In-depth study of the major groups of viruses pathogenic for humans; Structure, classification, replication, mechanisms of pathogenesis, immunology, and epidemiology. Letter grade only.

BIO 536 Antimicrobial Chemotherapy (3)
This course will focus on the study of major classes of antibiotics and chemotherapy of bacterial, viral, fungal and parasitic infections. Up-to-date drugs of choice for infectious disease treatment and pharmacologic properties will also be featured in this curse. Various methods utilized in the clinical and research laboratory to determine antimicrobial susceptibilities will also be demonstrated and discussed. Letter grade only.

BIO 539 Cell & Tissue Culture (3)
This course will introduce the concepts of cell and tissue culture, with specific laboratory exercises designed to expose the student, through the use of primary and established cell lines, to sterile technique, media preparation, quality control and cell line validation, passaging of no adherent and adherent cells, cryopreservation, and microscopy

and digital photography. Cellular assays for viability, proliferation, invasion, and apoptosis will be performed. Letter grade only.

BIO 548 Immuno-diagnostics (3)

This course covers basic clinical immunology and applications in laboratory medicine. Interactions among immune cells and their secretions are examined. The role of the immune system in tumor growth, transplantation and rejection, and autoimmune diseases is covered. Various methods utilized in the clinical laboratory and research settings will be demonstrated and discussed. This course also includes the principles and practices of quality control and pre-analytical, analytical, and post analytical components of clinical immunology. Letter grade only.

BIO 570 Medical Mycology (3)

This course consists of a basic introduction to medical mycology and a comprehensive study of the fungi (yeasts and molds) and mycoses (fungal diseases) likely to be encountered in clinical settings by a medical mycologist, or medical technologist. Attention will be distributed as equally as possible between emphasis on the biology of the fungal zoo pathogen and on its disease. Coconvenes with BIO 470. Letter grade only.

BIO 573 Field Ecology (4)

Applications of ecological issues in the field. Identification of original field research problems in diverse habitats, experimentation, data analyses, oral presentation of findings, and reports.

BIO 591 Thesis, Dissertation or Special Project I (3)

Prerequisite: Consent of the Instructor

An investigation of a problem undertaken by the student under the guidance of a faculty member, whatever the individual student's research project requires. Letter grade only.

BIO 592 Thesis, Dissertation or Special Project II (3)

Prerequisite: BIO 591

Continuation of BIO 601, an investigation of a problem undertaken by the student under the guidance of a faculty member, whatever the individual student's research project requires. Letter grade only.

BIO 593 Thesis, Dissertation or Special Project III (3)

Prerequisite: BIO 592

Continuation of BIO 602, an investigation of a problem undertaken by the student under the guidance of a faculty member, whatever the individual student's research project requires. Letter grade only.

BIO 594 Thesis, Dissertation or Special Project IV (3)

Prerequisite: BIO 593

Continuation of BIO 604, an investigation of a problem undertaken by the student under the guidance of a faculty member, whatever the individual student's research project requires. Letter grade only.

BIO 601 Thesis, Dissertation or Special Project I (3)

Prerequisite: Consent of the Instructor

An investigation of a problem undertaken by the student under the guidance of a faculty member, whatever the individual student's

research project requires. Letter grade only.

BIO 602 Thesis, Dissertation or Special Project II (3)

Prerequisite: BIO 601

Continuation of BIO 601, an investigation of a problem undertaken by the student under the guidance of a faculty member, whatever the individual student's research project requires. Letter grade only.

BIO 603 Thesis, Dissertation or Special Project III (3)

Prerequisite: BIO 602

Continuation of BIO 602, An investigation of a problem undertaken by the student under the guidance of a faculty member, whatever the individual student's research project requires. Letter grade only.

BIO 604 Thesis, Dissertation or Special Project IV (3)

Prerequisite: BIO 603

Continuation of BIO 603, An investigation of a problem undertaken by the student under the guidance of a faculty member, whatever the individual student's research project requires. Letter grade only.

BIO 698 Lab Seminar (2)

Discussion and directed study on current and relevant research in the mentor's lab and specifically on graduate student's research areas. Co-convenes with BIO 485, Undergraduate Research. Pass-fail or letter grade. May be repeated as needed. Instructor consent required. All graduate research faculty will teach this to their graduate students in their labs, and with consent, undergraduates in their lab.

BIO 699 Thesis Research (3)

Individualized directed research, writing, and oral defense of a selected thesis topic. May be repeated as needed. Department Consent. Pass-fail only. Prerequisite: Admission to master's program. All graduate faculty will teach this course.

NAS 513 Indigenous Research Methodology (3)

Prerequisite: Admission into Graduate Level Program or Instructor Approval

NAS 513 is an interdisciplinary graduate seminar which focuses on building reciprocal research relationships with Indigenous communities through the ethics, key criteria, protocols, methodologies, and methods of Indigenous research. This foundational training will prepare graduate students in the humanities, social sciences, and biological sciences for both future academic work and non-academic positions. As part of the class, students will design an Indigenous research project associated with their discipline and according to the guidelines provide by the Dine' College Institutional Review Board.

BIO 485 Undergraduate Research (1-6)

Prerequisite: repeat up to 12 units.

The course offers original research under the supervision of a researcher advisor. This course can be taken by undergraduate Honors Scholars in place of BIO 698. A total of 6 hours undergraduate credit can be used in place of graduate credit for the MS Biology degree. Therefore, this course is used for two semesters, at 3 credits each semester, in place of the two 3-hour BIO 698 course.

- Include the programs pathways to transfer internally/externally or directly into a career.

a) The pathways for students in the MS Biology program are explained to them in detail through their research experience and mentoring and collaboration, education in courses, seminars and at conferences. Transfer possibilities to research labs for Ph.D. degrees, or employment, or other career opportunities, are virtually unlimited. The most recent three MS graduates are currently working for their mentor, continuing their research and exploring future pathways.

C.2. Diné Identity and Program Uniqueness

- Provide a summary of how the Diné language is incorporated within the program curriculum. And provide a summary of how Diné history and culture are infused within content of the program curriculum
  a) 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:
     i) 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.
     ii) 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.
     iii) 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.

C.3. Instruction Method

- Schools should describe the instructional delivery methods used and whether the program is an interdisciplinary program. If so, then identify which other Schools are included. In addition, it should be noted whether this degree program, in its entirety can be completed online or at an external campus.
  a) The MS Biology program is interdisciplinary to the extent a student's research requires this. For instance, some students may need to take psychology courses for research in meditation and its mind/body psychophysiological effects. "Biology" is a very broad field of study, and all 21 students in the program are stretching the boundaries of this discipline into other disciplines, but arguably it is still within the domain of "Biology". Another aspect of "interdisciplinary" is in regards to the

required integration of the student's western-based research with Dine' values and knowledge.

b) 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.

- Analysis of modality and student success. Schools should evaluate modalities and location of their courses and entire program. How many faculty are credentialed to teach online courses.
  a) 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, so eventually the difficulty currently with travel requirements and on-site student resources will be much less.

C.4. Student Learning

- Please provide a brief summary of your program's student learning outcomes, assessment methods used to measure PSLOs and reason for selecting courses and artifacts. Include your program assessment report.

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.

Table 5. Program Matrix

Program Outcomes for MS in Biology Majors	BIO 501 Experimental design & statistical analysis	NAS 513 Indigenous Research Methods	BIO 500-604 Special topics electives	BIO 698 Graduate lab seminar	BIO 699 Thesis Research
Nitsáhákees – biological knowledge					
Outcome #1 Elucidate the major theories, research methods,			Artifact - Exit survey indicating what was		

Program Outcomes for MS in Biology Majors	BIO 501 Experimental design & statistical analysis	NAS 513 Indigenous Research Methods	BIO 500-604 Special topics electives	BIO 698 Graduate lab seminar	BIO 699 Thesis Research
approaches to inquiry and schools of practice in their biological discipline illustrating both the applications and relationships to other life sciences and biological disciplines. K			learned in these four courses. A		
Outcome #2 Interpret western knowledge and research findings, both in general and in relation to the student's research area, from the standpoints of Navajo cultural perspectives. K, T		Artifact – Diné cultural knowledge relationships documented in the Thesis. A (this was previously under Thesis Research)			
Nahat'a – planning, modes of inquiry					
Outcome #3 Identify, select, apply and defend the choice of experimental design, mathematical or statistical methods or					Artifact – Methods Chapter of Thesis. A

Program Outcomes for MS in Biology Majors	BIO 501 Experimental design & statistical analysis	NAS 513 Indigenous Research Methods	BIO 500-604 Special topics electives	BIO 698 Graduate lab seminar	BIO 699 Thesis Research
models appropriate to research questions. K, S					
Iiná – application of biological knowledge and inquiry					
Outcome #4 Perform empirical or experimental work independently, as well as collect, describe, analyze, and critically evaluate the experimental data. K, S, L					Artifact – Results Chapter of Thesis. A
Outcome #5 Document all research procedures, observations, and results of scientific investigations. S		Artifact – For BIO 503: written section of a grant proposal the student has written. A For NAS 513: use IRB document student does. A			
Siihásin – evolution of knowledge and inquiry					
Outcome #6 Present and defend an original scientific project with the				Artifact – Thesis *proposal defense* presentation to lab group	

Program Outcomes for MS in Biology Majors	BIO 501 Experimental design & statistical analysis	NAS 513 Indigenous Research Methods	BIO 500-604 Special topics electives	BIO 698 Graduate lab seminar	BIO 699 Thesis Research
purpose of generating new knowledge. K, S, L				or during department seminar. R	
Outcome #7 Draw meaningful conclusions from research findings, from both western and Navajo perspectives. K, T					Artifact – Diné cultural knowledge relationships documented in the Thesis. A
Outcome #8 Communicate biological knowledge, including results of research undertakings, and the rationale underpinning their conclusions, to specialist and non-specialist audiences, clearly and unambiguously. S, L				Artifact – Thesis defense, Journal article, Conference presentation or proceedings paper. M	

Note: Courses and their Artifacts are rated for the PSLOs as ***Introduced, Reinforced, Mastered, or Assessed*** as I, R, M, or A, respectively.

Note: Institutional Learning Outcomes (ILOs) are required to be indicated for each PSLO. Below are the ILOs. After each PSLO in the Matrix, the corresponding ILOs will be indicated by K for Knowledge, S for Skills, T for Tradition or L for Leadership.

Four Pillars

Institutional Learning Outcomes (ILOs)

(Experience over the course of the entire college experience)

Knowledge	Skills	Tradition	Leadership
Natural & Physical Sciences	Critical thinking	Navajo Culture	Collaboration
Mathematics	Analytical Reasoning	Responsibility	Teamwork
Humanities	Reading Comprehension	Civic Engagement	Confidence
Social & Behavioral Science	Oral Communication Skills	Navajo Language	Global Perspectives
Fine Arts & Media	Written Comm. Skills	Inclusiveness	Capacity for Cont. Learning
Professionalism	Creative Thinking	Life Long Wellness	Maturity
Diverse/Global Cultures	Ethical Reasoning	Self-Reflection	Civic Engagement
Communicate Effectively	Professional Conduct	Navajo History	Social Responsibility
Technology Literacy	Research Skills		Integration of Learning
	Interpersonal Skills		Adaptability
	Planning/Organization		Application of Knowledge
	Quantitative Reasoning		

KNOWLEDGE

- STEAM
- Fine Arts & Humanities
- Tech Literacy

SKILLS

- Communication
- Research
- Reading
- Knowledge Application

TRADITION

- Navajo Way of Life
- Dine Educational Paradigm
- Responsibility

LEADERSHIP

- Maturity
- Adaptability
- Confidence
- Creativity
- Inclusiveness

D. Program Faculty Profile

This section of the review analyzes the programs faculty and provides an overview of faculty characteristics over a four-year period.

D.1. Faculty Profile over a four-year period.

Table 5: Overview of Program Faculty

	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				

D.2. Student/Faculty Ratio over a four-year period.

This section of the review shows the student to faculty ratio over a four-year period.

Table 6: Overview of Student to Faculty Ratio

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

D.4. Full-time Faculty Management

- Describe full-time faculty support for college programs. How are full-time faculty mentored and supported? How is teaching performance of full-time faculty reviewed and how does the School respond to problems that are identified?
    - At Dine' College each faculty are observed in their course teaching by a peer faculty in the same discipline area during Spring semester. The Dean also evaluates the faculty in the Spring. Contracts are renewed in the Spring based on these two evaluations. Mentoring usually takes place informally by senior faculty in the discipline area of the faculty, then ongoing through collegial interaction with all other faculty.

D.5. Part-time Faculty Contribution and Evaluation

- How do the part-time faculty members contribute (may also include non-teaching) to the program? How are the part-time faculty evaluated?
    - We do not have any part time Instructors.

D.6. Reflection

- Overall, after reviewing various aspects of the faculty, what are the key findings? What are the strengths and opportunities to improve this area?
    - 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 "buddy-buddy" 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.

E. Student Profile

This section of the review analyzes students of the program.

E.1. Student demographics over four-year period.

Table 7: Overview of Student Profile

	2020-21	2021-22	2022-23	2023-24
Full-Time & Part-Time Students – unduplicated, includes fall, spring and summer terms	**Program started Fall 2022*		4	9
First Time First Year Enrollees			0	0
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

E.2. Student by Chapter affiliation

Table 8. Student by Chapter affiliation – over a 2-year period of all students

Chapter	Total # of students enrolled
Lukachukai	2
Coalmine Mesa	1
Shiprock	1
Pinon	1
Klagetoh	1
Tuba City	1
Chinle	1
Null – student did not disclose or no data in J1	1

F. Student Engagement and Learning Opportunities

F.1. Community Engagement

- Are there any community engagement activities between high schools, business communities, and community organizations with the department? How does the College support such community engagement activities for the students in this program?

F.2. High Impact Practices

- Identify the high impact practices that are incorporated into this program and its courses. High Impact practices refer to teaching and learning practices that have been shown to be beneficial for college students for student engagement and retention. High Impact practices may include experiences such as First Year Seminars, Writing Intensive Courses, Undergraduate Research, e-portfolios, Emphasis on Diversity/Global Learning, Service Learning, Community-Based Learning, Internships, Capstone Courses and Projects.

F.3. Co-curricular

i. Library Services

- How well does the Library meet the needs of the program? Describe the adequacy of the Library's holdings (e.g. databases, journals, books, and audiovisual materials). How do the collaborative information literacy instruction and reference/research assistance programs support the program being reviewed?
    - 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.

ii. Student Success Services

- How well does student success services meet the needs of the program?

- 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.

F.4. Course Satisfaction

- How satisfied are students with courses being offered?
  - Provide summarized course evaluations.
    - These will have to be provided by the Dean and Provost
  - How has the department responded to issues raised to course satisfaction concerns via quantitative and qualitative assessments?
    - 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.

F.5. Graduation Survey

- Summarize student responses in regards to career readiness, program satisfaction, services received and preparedness for transfer to another four-year institution.
  - PSLO #1 is currently being assessed for our December, 2024 and May, 2025 graduates. We hope to have results by the Site Visit on May 16.

G. **Resources**

G.1. Facilities

- Please describe the facilities that are used or associated with the degree program including but not limited to:
  - 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. Recently one of the biology rooms was made into a research focus for biology, another was made into a molecular research focus. Student labs still take place to some extent in these two rooms. Faculty are using other non-lab classrooms for lecture so these two rooms were decided to be a biology research and lab-prep focus.
        - Shiprock has a biology and a chemistry classroom in a new Math Science building.
        - Tuba City has one science lab classroom and two small labs for research and training, one biology and one chemistry.
    - office space, faculty office space: We have one Administrative Assistant office in Tsaile, and all faculty in Tsaile, Tuba City and Shiprock have their own offices.
    - and 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).
- Please also indicate whether the School financially and physically maintains these specific resources.
    - 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.

G.2. Operating Budget

- Provide a summary of the costs associated with the degree program. Indicate whether the cost to fund this program has increased over the years. This is not a financial audit, so in-depth descriptions of financial expenditures is not required. For example, indicate on average how much is spent annually on total faculty salaries, or operating costs, or co-curricular activities. DO NOT PROVIDE A DETAILED EXPENDITURE LIST.
    - 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. Actual dollar amounts of these costs by category should be supplied by the College finance team.

G. Review

Provide a brief reflection of all areas of criteria and indicate areas of improvement.

No areas of improvement are indicated at this time. We look forward to group discussion during the APR, final recommendations, and the resulting 3-year Action Plan.

H. Results of the Site Visit

Attach/include the Site Visit Day Agenda and the APR Evaluation Team Documents.

Tentative:

9:00 to 10:30 AS Biology APR
Break
10:45 to 12:15 BA Biology APR
Lunch
1:00 to 2:00 Tour of Biology Lab-Classrooms, Dr. Skaltsas' lab, Dr. Makeyev's lab, Dr. Hakim's lab
2:00 to 3:30 MS Biology APR

I. External Reviewer – Feedback and Response

Provide details of the external reviewer's feedback. Please summarize the suggestions and recommendations put forth by the External Reviewer.

J. Three-Year Action Plan

***I and J are NOT part of the self-study, but included in the APR Final Report.