SELF STUDY

PROGRAM REVIEW
BACHELORS OF SCIENCE
IN

Biology
(previously Biology for Information Systems)

COLLEGE OF ARTS AND SCIENCES
SPRING 2018
DAKOTA STATE UNIVERSITY

ONSITE VISIT DATE: 9 February 2018

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Part 1 - Institutional History

Dakota State University has enjoyed a long and proud history of leadership and service since its founding in 1881 as the first teacher education institution in the Dakota Territory.

For most of its history, DSU has been identified with teacher preparation, first as a normal school and later as a four-year public college. The University has had several different names, among them Madison Normal, Eastern Normal, and General Beadle State College. The name, Dakota State College, was adopted in 1969. On July 1, 1989, Dakota State College became Dakota State University. The University title was conferred on the institution by the South Dakota Legislature in order to better reflect its purpose in the total scheme of the state's higher education system. Prospective elementary and secondary teachers continue to be educated here. To this traditional emphasis, DSU added business and traditional arts and science programs in the 1960s and two health services programs, Health Information Management and Respiratory Care, in the late 1970s.

In 1984, the South Dakota Legislature and the South Dakota Board of Regents turned to Dakota State University to educate leaders for the information age. In response, Dakota State University developed leading-edge computer/information systems degree programs. The graduates of these programs enjoy enviable status in the national marketplace. As a leader in computer and information systems programs, DSU has pioneered the application of computer technology to traditional fields of academic endeavor. This thrust has led to the development of unique degree programs in biology, English, mathematics, and physical science.

In recognition of its pioneering academic programs and outreach efforts, DSU was selected as one of the ten finalists for the 1987 G. Theodore Mitau Award. The Mitau Award is peer recognition by the nation's largest association of higher education institutions, the American Association of State Colleges and Universities, of the nation's top state colleges and universities for innovation and change.

Dakota State University has been named to Yahoo Magazine's list of the 100 most wired universities in the U.S. - ranking 12th on the list in 1998, 10th on the list in 1999, 9th on the Baccalaureate II list in 2000, and 2nd on the list of top public comprehensive colleges in the Midwest according to the annual America's Best Colleges survey results released by the US News and World Report in 2005.

Dakota State University continues to serve the needs of a changing society in its second century. In order to provide its academic programs to a broader audience, DSU has taken a step forward in distance education and offers courses and academic programs via Internet, the Governor's Electronic Classroom, the Dakota Digital Network and the newly renovated Technology Classroom Building. As society's educational needs change, Dakota State University will continue to evolve to meet these needs with education, scholarship and service.

History of the University

- 1881 - Dakota Normal School established by the Territorial Legislature.
- 1947 - Name changed to General Beadle State Teachers College.
- 1969 - Name changed to Dakota State College.
- 1984 - SD Legislature mandated mission change at Dakota State. The new mission integrated technology across all areas of the curriculum.
- 1989 - Name changed to Dakota State University.
- 2004 - DSU goes wireless with tablet computer initiative. DSU is named Center of Information Assurance by the National Security Agency and the Department of Homeland Security.

Mission

The mission of Dakota State University as it appears in the Board of Regents Policy Manual (1:10:5, adopted 08/07) states:

The Legislature established Dakota State University as an institution specializing in programs in computer management, computer information systems, and other related undergraduate and graduate programs as outlined in SDCL § 13-59-2.2. A special emphasis is the preparation of the elementary and secondary teachers with expertise in the use of computer technology and information processing in the teaching and learning process.

The Board implemented SDCL § 13-59-2.2 by authorizing undergraduate and graduate programs that are technology-infused and promote excellence in teaching and learning. These programs support research, scholarly and creative activities and provide service to the State of South Dakota and the region. Dakota State University is a member of the South Dakota System of Higher Education.

DSU implemented a wireless mobile computing initiative in the fall of 2004, mandating student leases of tablet PCs with a nominal user fee. The widespread and thorough integration of the wireless computing throughout courses and programs is an example of DSU's continuous efforts to incorporate the latest in technology into the curriculum.

College Mission

The College of Arts and Sciences offers a variety of programs and courses leading to many successful career paths. Computer technology is integrated throughout all majors. The College offers the vast majority of the general education courses, serving as a background for all degrees. Faculty in Speech and Theater, English, and Digital Arts and Design are principally located in Beadle Hall. Math, science and social science faculty are housed in the C. Ruth Habeger Science Center. The clinical faculty in the Respiratory Care Program are located at Avera and Sanford Hospitals in Sioux Falls and Rapid City Regional Hospital in Rapid City, SD.

The College of Arts and Sciences offers degree programs in Biology, Biology Education, Computer Game Design, Digital Arts and Design, English Education, English for New Media, Mathematics, Mathematics Education, Physical Science, and Respiratory Care. In addition to these degree programs, the College of Arts and Sciences offers majors, minors, and courses which qualify students to apply for admission to professional schools and programs.

History of the Biology Program

A degree program in Biology for Information Systems was established at the time of the institutional mission change in 1984. This degree fit well with the defined focus of DSU on computer integration into the curriculum and served the needs of specialized health profession programs. Although there have been many changes in the technology available to the program, the basic goals of the program have remained largely unchanged since the inception of the mission change.

Beginning in the 2017-18 academic year the program name was changed from Biology for Information Systems to Biology. The information systems name was useful at the time of the mission change to distinguish the differences in programs at DSU, but the name was still unfamiliar to most people and often created problems for our majors applying to graduate programs, professional schools and other jobs. The biology program still includes strong support for the integration of computer technology in the program as befits the mission of Dakota State University. There is a required 15 credit science and technology component that is unique in the South Dakota Regental system, and the ways that computers have been integrated into all courses in the biology curriculum has greatly increased over time.

Date of last biology program review

The date of the last institutional program review was April 2009.

Outcomes of the last biology program review

The reviewer was impressed with the focused mission of Dakota State University based on the application of cutting edge technology to diverse academic programs. While the computer infrastructure reflected that focus, they felt that there was an underinvestment in the professional development of faculty to use this technology in innovative ways. In particular, the amount of money allocated to faculty for travel and training was not sufficient. The amount of money for professional development has not increased in the time since the review.

The reviewer thought that one of the greatest strengths of the Biology program was the well-qualified, teaching-oriented faculty. They were impressed with how much was accomplished with so little. This reviewer felt that there could be positive aspects of faculty teaching outside of their specialization because they could develop cross-disciplinary connections. Faculty-student relationships are warm and meaningful.

Students interviewed were enthusiastic about the faculty. It was recommended that a lab manager be hired to relieve the faculty of many routine responsibilities. In the years following the review, a manager was hired and has also helped with the teaching of introductory lab sections.

The curriculum was deemed an appropriate mix and balance of areas of biology. They suggested increasing molecular biology courses, especially in bioinformatics. A new course in bioinformatics was developed shortly following the review, and a new faculty member, Dr. Videau has an excellent background in the area. The reviewer also thought that links should be developed with other programs at DSU such as Digital Arts and Design. They suggested that the non-majors survey courses should be redesigned around a contemporary issues theme to better serve the general education goals of the state-wide system. This latter idea has been favorably discussed by the biology faculty, but has not been implemented to date.

The goals of the biology program were recognized as good, and the assessment plan considered reasonable. The reviewer suggested that the goals be mapped to specific courses in the curriculum, and that the faculty design instruments to assess competencies. There has been considerable work on assessment in the time since the last review. A curriculum map was developed. Work has begun on making assignments that directly assess student learning outcomes in both general education and upper level courses. In fact, the Board of Regents have convened a committee to revise the entire general education assessment process which is being implemented on campuses over the next few years.

The small number of biology majors and low retention and graduation rates were cited as a major concern. The reviewer suggested increased marketing about the variety of careers available to biology graduates and to gather more information about why students do not stay in the program until graduation. The number of majors did increase somewhat in recent years, but total program enrollment is still a concern. Dakota State just received a Title III grant that is focused on improving retention rates across the institution. A few of the initiatives being developed are programs to track student progress, improve advising, and provide supplemental instruction.

Part 2 Trends in the Academic Program

The exponential growth of knowledge in biology is occurring at all levels of investigation from molecular to ecosystems and at every level in between. New journals devoted to specialized disciplines appear frequently. Because of globalization, issues that once may have been considered local now affect much broader areas. Today, in biology the frontier is anywhere and everywhere, and it changes at an unbelievable pace. Computer technology is integrated into these discoveries in different ways, but it is present at all levels.

Ways trends have influenced the biology program, as well as ways trends are likely to influence the program in the future.

Academic programs are charged with the task of educating students to be effective and productive in fields which are ever changing. Trends have fluctuated wildly, but a constant is providing students with the best possible background for fields or areas which may not have existed at the beginning of an undergraduate career. Although some universities have chosen to focus undergraduate education on areas related to specific trends, others seek to provide a firm foundation geared toward providing students with a solid foundation designed to enable students to thrive as new discoveries challenge the discipline to change in response to new developments.

The biology program at DSU has chosen to focus on providing students with a strong foundation firmly grounded in core principles. In addition, computer technology has been, and continues to be, integrated into the program. Rooted in the mission of DSU, the Biology program chooses to continue to integrate computer technology and to train students in a broad manner.

Therefore, biology graduates need strong backgrounds in physics, chemistry, and mathematics as biological research becomes more interdisciplinary. There has been reform in biological education with decreased emphasis on learning large bodies of factual information and more emphasis on the development of critical thinking abilities and the integration of traditional scientific disciplines, such as physics, chemistry, and biology. Moreover, active learning approaches are becoming more and more fundamental in the educational experience.

The program is firmly committed to training students as scientists by emphasizing skills such as hypothesis development, experimental design, and data analysis throughout the program. The development of these skills culminates in the required undergraduate research component of the curriculum. The ability to communicate the process of science in both written and oral modes is emphasized in all stages of the student's program.

Program limitations relative to trends (concerns related to human, financial and physical resource information)

Biology program limitations are primarily linked to human and financial resources. The program is currently staffed with three tenure-track professors who must teach all of the sub-disciplines within their respective fields (and then some). In addition, the large numbers of students taking introductory and general education courses consumes a large amount of faculty time (course enrollments for biology courses are included later in this document).

The only consistent funding source for equipment and supplies are lab fees charged to students. The amount generated each year is insufficient to finance all of the equipment purchases and upgrades needed for a program trying to increase faculty and undergraduate research as well as more active investigations in the classroom and

laboratory. Consequently, lab fees must accumulate for several years before purchases can be made, making it difficult to strategize the purchase of new equipment (especially specialized equipment). For example, analytical and molecular biology equipment considered standard in most university lab settings are very slow in coming to our program, which necessitates significant improvisational teaching on the part of the faculty. Such creativity certainly has the power to inspire/serve our students in imaginative ways, but the lack of instrumentation translates into our students entering the professional world (or graduate education) lacking essential skill sets. While the faculty continue to actively pursue small grant opportunities for much-needed new equipment (and existing equipment upgrades), given the constraints of faculty teaching loads, they are afforded little time or institutional support for developing competitive grant proposals. Worse, as DSU is not known for its scientific accomplishments, even strong grant proposals are not well received by major funding agencies.

These problems make it very difficult for the science faculty to work creatively outside the constraints of teaching demands. Research activities and service to the community are also limited by high teaching loads. However, one strength of the program continues to be its location in the Science Center, with the science and math faculty housed in a single building with recently remodeled classrooms and laboratories. Such proximity under one roof brings faculty from all disciplines together as neighbors, greatly increasing the possibilities of cross-collaborative creativity and continually demonstrating to students the strongly collaborative nature of the scientific enterprise.

Part 3 Academic Programs and Curriculum

Academic degrees offered

Currently, students can obtain a Bachelor of Science in Biology. Students with majors in other programs may elect a Biology Minor.

Curricular Options

A curriculum change establishing options within the biology course selections was proposed this year. The intent of these emphasis area divisions is to clearly identify pathways for career preparation. The Molecular Biology Emphasis is designed for students entering health professions or graduate programs. The Integrative Biology Emphasis is designed for students seeking careers in environmental biology, agricultural science, or similar fields of study. The proposed changes are listed below. The curriculum proposal has been passed by biology faculty, the College of Arts and Sciences, the DSU Curriculum Committee, and will be forwarded to the Board of Regents for action in spring 2018.

Proposed emphasis areas within the biology course selections (to take effect in academic year 2018-2019):

Biology core:		
BIOL 145	Introduction to Scientific Inquiry	1
BIOL 151	General Biology I	4
BIOL 153	General Biology II	4
BIOL 221	Human Anatomy	4
BIOL 280	Inquiry and Analysis in Biology	2
BIOL 311	Principles of Ecology	4
BIOL 331	Microbiology	4
BIOL 371	Genetics	4
BIOL 498	Undergraduate Research/Scholarship	2
Choose one of the following emphases:		
Molecular Biology Emphasis		
BIOL 325	Physiology	4
BIOL 343	Cell and Molecular Biology	4
BIOL 422	Immunology	3
BIOL 492	Topics	1-4
BIOL	Biology electives	4-7
Integrative Biology Emphasis		
BIOL 365	Vertebrate Biology	4
BIOL 422	Conservation Biology	3
BIOL 450	Aquatic Biology	4
BIOL 492	Topics	1-4
BIOL	Electives	4-7

Comparison of the program being reviewed with regional programs

There is a great need in South Dakota and the surrounding region for biological science graduates in education, the health professions and industry as evidenced by the high placement rate of our graduates. The demand is especially high for those professionals who are computer literate and understand the impact of information technology on society. The mission of Dakota State makes it an ideal institution for providing an environment where basic education in biology and allied sciences is integrated with training in computer technology.

Most of the colleges and universities in the region offer biology degrees. The South Dakota School of Mines and Technology recently added degree programs in Applied Biology and Biomedical Engineering. With that addition, all of the institutions in the South Dakota Regental System have biology programs. The biology degrees at DSU are very different, however, with the emphasis on the integration of computer technology. The institution's wireless mobile computing initiative brings the expectation of even greater use of computer technology. As a consequence, the level of computer integration into a general biology curriculum is unmatched in the region.

Special Strengths of the Biology Program

Integration of Computer Technology

As stated in the previous section, the biology program at Dakota State University is unusual in the emphasis placed on the use of computer technology both in the classroom and in research. All students at DSU lease a Tablet PC (currently a Fujitsu T1010, or comparable computer). A wireless network is available throughout the entire campus.

The biology faculty have embraced the use of these computers in the classroom and lab. All courses have a course management site developed with Desire2Learn software which facilitates communication among faculty and students, and provides a portal for posting information, submitting assignments and checking grades. In addition, simulation software (e.g., Simbio), spreadsheets, and graphing programs are used in nearly all courses. In the laboratory, wireless computer technology has been incorporated as a tool for gathering and/or recording data, analyzing data and reporting data. Imaging technology is utilized in 1) visualization of concepts and processes integral to the understanding of biology in a hands-on laboratory setting; 2) collection of data in a laboratory setting utilizing computer integrated probes; 3) utilization of student-generated data as a foundation for analysis and graphing, interpretation, and presentation; 4) making connections between concepts and skills that will be valuable in all disciplines; and 5) forming a solid foundation for all biology upper-level courses.

Taking advantage of the tablet computer initiative and strong computer infrastructure at DSU, faculty have developed specific courses that teach the process of science and encourage the use of computer technology to facilitate inquiry (BIOL 281, SCTC 303). Students are challenged to develop their skills as scientists. They must form hypotheses, design experiments, collect and analyze data, and draw conclusions. Strategies for searching for information and effective oral and written presentation of the results are emphasized. Students are learning advanced skills that will make them better critical thinkers, and developing skills that they will use in their professional careers.

Interaction of Faculty and Students

One of the strengths of the program is the focus on the students and the opportunity for students and faculty to work closely together. The opportunity to interact frequently with students allows the faculty members to provide educational opportunities that more closely match the student's career goals.

Undergraduate Research

The biology program places a high priority on increasing the involvement of students in undergraduate research projects. In order to do this, the biology faculty strive to build a culture where more rigor is expected in undergraduate research projects. Students are encouraged to begin projects earlier and design projects that test hypotheses.

Several of the student projects have resulted in presentations at national and regional organizations such as American Society for Microbiology, Society for Environmental Toxicology and Chemistry, American Chemical Society, and the South Dakota Academy of Sciences. A listing of student projects for the last 7 years can be found in Appendix B.

Supporting the System-wide Goals for General Education

The biology courses at DSU play a crucial role in the general education curriculum. They are essential to support the goals of thinking critically and analytically, problem solving, developing research skills, and giving students a diverse program of study. Specifically, Biology Survey I and II, General Biology I and II, and Zoology meet the goals and outcomes of the system-wide goal for natural science:

Regental General Education Goal (#6): Students will understand the fundamental principles of natural sciences and apply scientific methods of inquiry to investigate the natural world.

Student Learning Outcome 1: Demonstrate the scientific method in a laboratory experience.
Student Learning Outcome 2: Gather and critically evaluate data using the scientific method.
Student Learning Outcome 3: Identify and explain the basic concepts, terminology, and theories of biology.
Student Learning Outcome 4: Apply selected concepts and theories of biology to contemporary issues.

Student Progression

The recommended sequence of courses in biology is designed to provide biology majors with an introduction to biological principles in General Biology I (BIOL 151) followed by General Biology II (BIOL 153) which covers diversity of life in an evolutionary context. After completing these core courses, students are prepared to take the 300 level courses in biology: Ecology (BIOL 311), Microbiology (BIOL 331), Genetics (BIOL 371) and Cell and Molecular Biology (BIOL 343). Students enrolling in Physiology (BIOL 325) must have successfully completed Human Anatomy (BIOL 221). Aquatic Biology (BIOL 450) has a recommended prerequisite of Ecology. Prerequisites for Advanced Special Topics (BIOL 492) are determined by the instructor. Prerequisite courses are recommended, not required, because most of the upper level courses in biology are offered on an every other year schedule. Often students may not have had the opportunity to take the courses in the preferred sequence. Students must have junior status and 15 hours of biology to enroll for their capstone experience in Undergraduate Research (BIOL 498).

PLAN OF STUDY

A suggested sequence of courses for Biology students is available in the Course Catalog. The check sheet allows them to plan their semester schedules and time of graduation. The outline is just a model, however because many upper level courses are offered on an every other year schedule. Students work closely with their advisor to develop a more accurate plan that meets their circumstances. The plan of study for Biology can be found in Appendix C.

All student records at DSU are accessible to their advisor through a web-based interface called Webadvisor. Advisors and students can view schedules and transcripts. Also, they can perform a program evaluation that indicates which requirements remain in a student's program. Webadvisor allows for online searching of courses, and students may register for classes themselves after consulting with their advisor.

Curriculum Management

The following is a list of the courses in biology currently offered at Dakota State University:

BIOL 101 Biology Survey I (non-majors)	3 credits
BIOL 103 Biology Survey II (non-majors)	3 credits
BIOL 145 Introduction to Scientific Inquiry	1 credit
BIOL 151 General Biology I	4 credits
BIOL 153 General Biology II	4 credits
BIOL 165 General Zoology	4 credits
BIOL 221 Human Anatomy	4 credits
BIOL 281 Inquiry and Analysis in Biology	2 credits
BIOL 291 Special Problems	1-4 credits
BIOL 292 Topics	1-4 credits
BIOL 311 Principles of Ecology	4 credits
BIOL 323 Human Anatomy and Physiology	4 credits
BIOL 325 Physiology	4 credits
BIOL 331 Microbiology	4 credits
BIOL 343 Cell and Molecular Biology	4 credits
BIOL 365 Vertebrate Biology	4 credits
BIOL 371 Genetics	4 credits
BIOL 410 Conservation Biology	3 credits
BIOL 422 Immunology	3 credits
BIOL 450 Aquatic Biology	4 credits
BIOL 491 Independent Study	1-4 credits
BIOL 492 Topics	1-5 credits
BIOL 498 Undergraduate Research/Scholarship	1-6 credits
SCTC 303 Intro. to Biological Instrumentation	3 credits
SCTC 345 Introduction to Bioinformatics	3 credits

Summary of Changes in the Curriculum Since the Last Biology Review.

Shortly after the biology review, significant changes in the biology curriculum were made in 2010 to make the major more flexible by eliminating two existing specializations; one in Health and Technology and another in Business. The number of free elective credits was increased to allow students to choose courses that are appropriate for a wide variety of career options such as science journalism or illustration, environmental science, agribusiness or laboratory science.

In accord with the institutional mission to integrate computer technology into degree programs, the science technology section of the program was completely revised. Courses which were not specific to the use of technology in science were eliminated, and a new course in bioinformatics (SCTC 345) was added. With elective courses in computer science, students could receive a strong background in the emerging fields of bioinformatics and biotechnology. Included within the technology area was the addition of ENGL 379 Technical Writing to serve as the upper level writing intensive class for the major.

The course BIOL 323 Human Anatomy and Physiology is unique to DSU within the South Dakota system and was developed many years ago to serve the Health Information Management and Respiratory Care programs. This course was replaced in the biology major with BIOL 221 Human Anatomy. The latter is a common course in the Regental system and has similar content. Offering common courses simplifies the transfer of credits. BIOL 323 continues to be offered online to support the allied health programs.

Two other common courses in the system BIOL 365 Vertebrate Zoology and BIOL 410 Conservation Biology were added to strengthen the offerings in environmental and organismal biology. These courses had been taught previously at DSU as special topics classes.

Beginning in the academic year 2012-13, the Board of Regents reduced the number of credit hours required to receive a bachelor's degree from 128 to 120 hours. The biology program accomplished this change by reducing free elective credits from 17 to 10 hours and deleting a one credit class SCTC 315 Introduction to Statistics for Biology. The content of this class was moved into other SCTC courses.

MATH 123 Calculus I and PHYS 111 Introduction to Physics I were moved from required to the elective list in the Math and Science Support component of the major. Many biology majors still take these courses, but flexibility was needed for students with career plans that do not require calculus and physics courses.

In 2017 the Board of Regents required campuses to eliminate long-standing Institutional Graduation Requirements. At Dakota State, these institutional requirements included an introductory computer course and a programming course, a writing-intensive social science course, and two credits of wellness classes for a total of 11 credit hours. As an institution DSU decided to continue to require the two introductory computer courses. In biology

these courses were moved to the science and technology courses component section. Another 3 credits from the removal of the requirements was allocated to a social science course to meet the growing demand for social science in the health professions.

Additionally, the biology program made several other changes to the curriculum primarily in response to changes in faculty. BIOL 153 General Biology II was added to the required course list and replaced BIOL 165 General Zoology and BIOL 201 General Botany as degree requirements. Botany and zoology will be occasionally be taught as general education courses. A new course BIOL 280 Inquiry and Analysis in Biology was added to teach lower level students the foundational skills needed for success in upper level biology courses. BIOL 422 Immunology was added as an elective in the biology component to meet the needs of students preparing for careers in the health professions.

Enrollment Statistics for Course Offerings

Course	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
BIOL 101 Bio Survey I*	114 /85	113/91	92 /75	92 /88	83/ 99	98 /78	92/98
BIOL 101 Bio Survey I* +		22	24	47	42	41	47
BIOL 101 Bio Survey I MHS				30	42	30	46
BIOL 103 Bio Survey II*	45/72	44/72	38/74	39/53	55/60	39/53	35 & 68
BIOL 103 Bio Survey II* +		15	33	29	22	25	26
BIOL 145 Scientific Inquiry	13	12	10	17	11	6	10
BIOL 151 Gen. Biology I*	71	89	82	69	65	48	39
BIOL 165 Gen. Zoology*	34	28	21	31	35		28
BIOL 201 Gen. Botany*	18		15		23		13
BIOL 221 Human Anatomy		28	46	54	56	43	27
BIOL 311 Ecology	14		16		13		19
BIOL 323Anat. & Phys.	18/49	26		27/28	15/16	15/26	10/25
BIOL 325 Physiology	20	36	19	26	35	18	24
BIOL 331 Microbiology		18		16		21	
BIOL 343 Cell & Mol. Biol.		9		11		21	
BIOL 365 Vertebrate Zool.				9		12	
BIOL 371 Genetics	18		15		17		
BIOL 410 Conservation Biol.	6		6		10		12
BIOL 450 Aquatic Biology		9		6		11	
BIOL 491 Adv. Ind. Study	1	1					2
BIOL 492 Adv. Spec. Top.	2	13	2	18	6	22	1
BIOL 498 Capstone	2/5	4/1	2/3	5/6	2/4	1/5	1/12
SCTC 303 Intro Biol Inst.				14		19	
SCTC 345 Bioinformatics			17		12		15

/ If offered in both semesters, fall and spring enrollments reported respectively.
* Courses that may be taken in fulfillment of general education requirements.
+ Online only sections

Enrollment Statistics for Summer Course Offerings

Course	2010SU	2011SU	2012SU	2013SU	2014SU	2015SU	2016SU
BIOL 165 General Zool.	0	0	14	13	8	8	20
BIOL 323 Anat. & Phys.	0	0	15	10	4	6	5

Relationships with Other Programs at Dakota State University

The Bachelor of Science in Education, Biology Education degree is cooperatively administered through the biology program and College of Education. Dr. Kristel Bakker, Professor of Biology, is the academic advisor for biology education students and a member of the campus Professional Education Council. Biology education students take many of the same courses as the biology majors (shown below), but also take nearly 30 credits of education classes and complete a one year student teaching internship. The Biology Education program is reviewed with other education degrees by the South Dakota Department of Education.

Biology Component for Biology Education Majors (40 Credits)

- BIOL 145 - Introduction to Scientific Inquiry 1 credit
- BIOL 151 - General Biology I 4 credits
- BIOL 153 - General Biology II 4 credits
- BIOL 221 - Human Anatomy 4 credits
- BIOL 280 - Inquiry and Analysis in Biology 1 credit
- BIOL 280L - Inquiry and Analysis of Biology Laboratory 1 credit
- BIOL 311 - Principles of Ecology 4 credits
- BIOL 371 - Genetics 4 credits
- BIOL 498 - Undergraduate Research/Scholarship (2 credits required)

Choose 15 credits from the following (15 Credits)

- BIOL 325 - Physiology 4 credits
- BIOL 331 - Microbiology 4 credits
- BIOL 343 - Cell and Molecular Biology 4 credits
- BIOL 365 - Vertebrate Zoology 4 credits
- BIOL 410 - Conservation Biology 3 credits
- BIOL 422 - Immunology 3-4 credits (3 credits required)
- BIOL 450 - Aquatic Biology 4 credits
- BIOL 492 - Topics 1-5 credits

Many of the courses in the biology program are required for students in other majors. Students in Respiratory Care and Health Information Management take BIOL 151 General Biology and BIOL 221 Human Anatomy. Students in the B.S. in Respiratory Care degree program also take BIOL 331 Microbiology.

Students in the Exercise Science program are required to take BIOL 151 General Biology, BIOL 221 Human Anatomy and BIOL 325 Physiology. The list of elective support courses includes BIOL 331 Microbiology, BIOL 343 Cell and Molecular Biology, and BIOL 371 Genetics.

Students in other majors, especially secondary education, may select a minor in biology. A minor in biology consists of the following courses:

BIOL 151 General Biology
BIOL 165 General Zoology
BIOL 201 General Botany
BIOL 311 Principles of Ecology
BIOL 371 Genetics

A curriculum proposal to change the courses required for a biology minor was proposed during the current academic year (2017-18). The intent of the proposal is to give students more flexibility in course selection for a minor. This may be particularly attractive to students in exercise science who already take 4 biology courses. The proposed changes are shown below. The curriculum proposal has been passed by biology faculty, the College of Arts and Sciences, the DSU Curriculum Committee, and will be forwarded to the Board of Regents for action in spring 2018.

Pref.	**Num.**	**Title**	**Cr. Hrs.**
Biology			**19-21**
BIOL	151	General Biology I	4
BIOL	153	General Biology II	4
Choose 11-12 credits from the following:			
BIOL	221	Human Anatomy	4
BIOL	311	Principles of Ecology	4
BIOL	331	Microbiology	4
BIOL	343	Cell and Molecular Biology	4
BIOL	325	Physiology	4
BIOL	365	Vertebrate Zoology	4
BIOL	371	Genetics	4
BIOL	410	Conservation Biology	3
BIOL	422	Immunology	3
BIOL	450	Aquatic Biology	4
SCTC	345	Intr. To Bioinformatics	3
SEED	303	Secondary/Middle Content Area:Minor*	1
		*Required for Education Majors Only	

Instructional Methodologies

The faculty utilizes a variety of instructional methods including lecture, laboratory, multimedia, and use of other computer technology. Most classes involve at least a moderate degree of lecture and discussion. Methods that involve hands-on learning are emphasized in lecture and laboratory, including writing to learn, cooperative learning, and a large range of group activities. All courses except some special topics offerings include laboratory exercises. Over the last several years, a greater emphasis has been placed on oral and written presentations by students. Computer use in the classroom and laboratory is required and creative ways to integrate technology are highly encouraged.

Part 4 Program Enrollments, Retention, and Student Placement

Total Enrollment

Program enrollment is based on the number of students enrolled in at least one DSU class with an active program of Biology for Information Systems (BS) as of fall census.

University and college enrollment is based on the number of students enrolled in at least one DSU class as of fall census. If a student is enrolled in multiple programs, they are only counted once at the university level.

Table 1: Program, College and University Enrollments

	Fall 2009	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016
Biology for Information Systems (BS)	22	27	27	37	44	32	29	40
College of Arts & Sciences	487	575	506	490	465	503	564	528
University Enrollment	2861	3101	3102	3110	3129	3047	3145	3190

Table 2: Student Diversity – Gender & Ethnicity

	Fall 2009	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016
Biology for Information Systems (BS)								
Gender								
Female	11	12	14	21	21	18	18	26
Male	11	15	13	16	23	14	11	14
Ethnicity								
White	21	23	24	26	33	24	22	33
Other Races/Unknown	1	4	3	11	11	8	7	7
College of Arts & Sciences								
Gender								
Female	274	314	265	242	219	264	280	277
Male	213	261	241	248	246	239	284	251
Ethnicity								
White	411	478	433	410	388	411	481	451
Other Races/Unknown	76	97	73	80	77	92	83	77
University Diversity								
Gender								
Female	1500	1620	1590	1525	1468	1364	1349	1355
Male	1361	1481	1512	1585	1661	1683	1796	1835
Ethnicity								
White	2399	2679	2694	2661	2626	2461	2581	2570
Other Races/Unknown	462	422	408	449	503	586	564	620

A student with an ethnicity of white includes only those students who are non-Hispanic with a race of white only. Immigration status is not considered.

Degrees Awarded

Table 3: Number of Degrees Awarded by Academic Year

Program	Academic Year							
	2008-2009	**2009-2010**	**2010-2011**	**2011-2012**	**2012-2013**	**2013-2014**	**2014-2015**	**2015-2016**
Biology for Information Systems (BS)	8	4	6	3	5	8	7	13
College of Arts & Sciences	70	66	70	65	71	63	56	68
University	311	313	357	384	409	401	409	466

An academic year is defined as summer, fall, and spring for the purpose of this report.

Persistence

Persistence is defined as: The proportion of a student cohort who enrolled for the first time in a given fall semester and then re-enrolled in a subsequent spring semester. The student must be enrolled in at least one DSU class to be considered persisted. For persistence purposes, specific populations are used: (1) first-time, full-time, baccalaureate degree-seeking freshmen; (2) incoming degree-seeking transfers (includes part-time and full-time). A student may be counted more than once. If the student is seeking multiple majors, they will be counted in each major.

Table 4: Persistence Rates for First-time, Full-time, Baccalaureate Degree-seeking Freshmen (Fall 2009 to Fall 2016 Cohorts)

	Fall 2009 Cohort		**Fall 2010 Cohort**		**Fall 2011 Cohort**		**Fall 2012 Cohort**	
	N	% Ret. 2nd semester (SP10)	N	% Ret. 2nd semester (SP11)	N	% Ret. 2nd semester (SP12)	N	% Ret. 2nd semester (SP13)
Biology for Information Systems (BS)	6	67%	6	83%	6	67%	13	100%
College of Arts & Sciences	97	85%	83	84%	75	81%	69	88%
University	274	88%	302	88%	277	81%	283	91%

	Fall 2013 Cohort		**Fall 2014 Cohort**		**Fall 2015 Cohort**		**Fall 2016 Cohort**	
	N	% Ret. 2nd semester (SP14)	N	% Ret. 2nd semester (SP15)	N	% Ret. 2nd semester (SP16)	N	% Ret. 2nd semester (SP17)
Biology for Information Systems (BS)	9	78%	3	100%	6	67%	10	90%
College of Arts & Sciences	63	86%	52	88%	66	85%	63	78%
University	276	88%	262	90%	320	87%	305	86%

N=total number of students
% Ret 2nd semester = the percentage of students from the cohort who registered for at least one DSU class in the subsequent spring.

Table 6: Persistence Rates for Incoming Degree-Seeking Transfers (Fall 2009 to Fall 2016 Cohorts)

	Fall 2009 Cohort		**Fall 2010 Cohort**		**Fall 2011 Cohort**		**Fall 2012 Cohort**	
	N	% Ret. 2nd semester (SP10)	N	% Ret. 2nd semester (SP11)	N	% Ret. 2nd semester (SP12)	N	% Ret. 2nd semester (SP13)
Biology for Information Systems (BS)	0	N/A	5	80%	2	100%	2	50%
College of Arts & Sciences	45	73%	59	85%	51	80%	53	68%
University	201	81%	198	83%	226	81%	275	76%

	Fall 2013 Cohort		Fall 2014 Cohort		Fall 2015 Cohort		Fall 2016 Cohort	
	N	% Ret. 2nd semester (SP14)	N	% Ret. 2nd semester (SP15)	N	% Ret. 2nd semester (SP16)	N	% Ret. 2nd semester (SP17)
Biology for Information Systems (BS)	3	67%	1	100%	0	n/a	4	100%
College of Arts & Sciences	42	74%	32	72%	27	74%	30	80%
University	259	80%	259	75%	255	82%	272	79%

N=total number of students
% Ret 2nd semester = the percentage of students from the cohort who registered for at least one DSU class in the subsequent spring.

Retention

Retention is defined as: The proportion of a student cohort who enrolled for the first time in a given fall semester and then re-enrolled in a subsequent fall semester. The student must be enrolled in at least one DSU class to be considered retained. For retention purposes, specific populations are used: (1) first-time, full-time, baccalaureate degree-seeking freshmen; (2) incoming degree-seeking transfers (includes part-time and full-time). A student may be counted more than once. If the student is seeking multiple majors, they will be counted in each major.

Table 8: Retention Rates for First-time, Full-time, Baccalaureate Degree-seeking Freshmen (Fall 2009 to Fall 2015 Cohorts)

	Fall 2009 Cohort		Fall 2010 Cohort		Fall 2011 Cohort		Fall 2012 Cohort	
	N	% Ret. 2nd year (FA10)	N	% Ret. 2nd year (FA11)	N	% Ret. 2nd year (FA12)	N	% Ret. 2nd year (FA13)
Biology for Information Systems (BS)	6	67%	6	83%	6	67%	13	85%
College of Arts & Sciences	97	62%	83	65%	75	68%	69	64%
University	274	64%	302	67%	277	60%	283	69%

	Fall 2013 Cohort		Fall 2014 Cohort		Fall 2015 Cohort	
	N	% Ret. 2nd year (FA14)	N	% Ret. 2nd year (FA15)	N	% Ret. 2nd year (FA16)
Biology for Information Systems (BS)	9	56%	3	67%	6	67%
College of Arts & Sciences	63	62%	52	73%	66	74%
University	276	65%	262	74%	320	72%

N=total number of students
% Ret 2nd year = the percentage of students from the cohort who registered for at least one DSU class in the subsequent fall.

Table 10: Retention Rates for Incoming Degree-Seeking Transfers (Fall 2009 to Fall 2016 Cohorts)

	Fall 2009 Cohort		Fall 2010 Cohort		Fall 2011 Cohort		Fall 2012 Cohort	
	N	% Ret. 2nd year (FA10)	N	% Ret. 2nd year (FA11)	N	% Ret. 2nd year (FA12)	N	% Ret. 2nd year (FA13)
Biology for Information Systems (BS)	0	n/a	5	60%	2	100%	2	50%
College of Arts & Sciences	45	60%	58	52%	51	57%	53	53%
University	201	63%	198	65%	226	61%	275	59%

	Fall 2013 Cohort		Fall 2014 Cohort		Fall 2015 Cohort	
	N	% Ret. 2nd year (FA14)	N	% Ret. 2nd year (FA15)	N	% Ret. 2nd year (FA16)
Biology for Information Systems (BS)	3	33%	1	100%	0	n/a
College of Arts & Sciences	42	52%	32	72%	27	56%
University	259	61%	259	61%	255	66%

N=total number of students
% Ret 2nd year = the percentage of students from the cohort who registered for at least one DSU class in the subsequent fall.

Graduation Rates

Table 12: Graduation Rates for First-time, Full-time, Baccalaureate Degree-seeking Freshmen (Fall 2004 to Fall 2010 Cohorts)

	Fall 2004 Cohort					Fall 2005 Cohort				Fall 2006 Cohort					
	Total No. of Students in Cohort	Graduate within 5 years		Graduate within 6 years		Total No. of Students in Cohort	Graduate within 5 years		Graduate within 6 years	Total No. of Students in Cohort		Graduate within 5 years		Graduate within 6 years	
		N	%	N	%		N	%	N	%		N	%	N	%
Biology for Information Systems (BS)	5	1	20 %	1	20%	3	0	0%	0	0%	5	2	40%	2	40%
College of Arts & Sciences	83	32	39 %	34	41%	74	15	20%	20	27 %	110	35	32%	37	34%
University	227	94	41 %	100	44%	246	66	27%	84	34 %	289	113	39%	121	42%

	Fall 2007 Cohort					Fall 2008 Cohort				
	Total No. of Students in Cohort	Graduate within 5 years		Graduate within 6 years		Total No. of Students in Cohort	Graduate within 5 years		Graduate within 6 years	
		N	%	N	%		N	%	N	%
Biology for Information Systems (BS)	3	0	0%	0	0%	5	0	0%	0	0%
College of Arts & Sciences	85	31	36%	35	41%	91	25	27%	33	36%
University	224	96	43%	109	49%	251	88	35%	102	41%

	Fall 2009 Cohort					Fall 2010 Cohort				
	Total No. of Students in Cohort	Graduate within 5 years		Graduate within 6 years		Total No. of Students in Cohort	Graduate within 5 years		Graduate within 6 years	
		N	%	N	%		N	%	N	%
Biology for Information Systems (BS)	6	2	33%	2	33%	6	2	33%	2	33%
College of Arts & Sciences	97	30	31%	36	37%	83	23	28%	26	31%
University	273	93	34%	107	39%	302	101	33%	113	37%

N=number of students; % = the percentage of students from the cohort who graduated.

Employment potential and placement

At least 75% of students from Biology for Information Systems found placement in either an appropriate position or chose to continue their education in graduate or professional school. The following table shows examples of the positions and geographic locations of student placement since the last biology program review.

Table 13: Placement descriptions of program graduates. Unknown may be placed in field.

Year	Placement
2010	Two students accepted to University of North Dakota Physical Therapy program, Grand Forks, ND.
	South Dakota Game, Fish and Parks
	Idaho Fish and Game Department
	South Dakota State Pharmacy Program, Brookings, SD
	1 continuing education
2011	Captain, US Army, specialist in hazardous chemicals
	Artesian Honey Producers, Artesian, SD
	Sanford Health, Sioux Falls, SD
2012	Cigna Specialty Pharmacy, Sioux Falls, SD
	Biology graduate program, Texas A&M University
	1 unknown
2013	Accelerated nursing program, South Dakota State University
	Medical Laboratory Graduate Program, University of South Dakota
	Project Coordinator, Veteran's Affairs, Denver, CO.
	3 employed in fields outside biology
2014	Biology graduate program, Lincoln University, Christchurch, NZ Currently field ranger for Zero Invasive Predators in NZ
	Lab technician, Sanford Health, Sioux Falls, SD
	Accelerated nursing program, South Dakota State University
	University of North Dakota Physical Therapy program, Grand Forks, ND.
	Nursing Program, LSU-Alexandria, Alexandria, La.
	1 unknown
2015	Alumend, biotechnology company, Sioux Falls, SD
	Physician Assistant Program, Union College, Lincoln, NE
	Physical Therapy Program, University of British Columbia, Vancouver, BC, Canada
	Physician Assistant Program, University of South Dakota
	Occupational Therapy Program, AZ School of Medical Sciences
	Clinical epidemiologist, Sanford Health, Sioux Falls, SD
	1 unknown
2016	Physical Therapy Program, University of South Dakota
	Two students in Accelerated nursing program, South Dakota State University
	Biology graduate program, University of South Dakota and Sanford Health
	South Dakota Game, Fish, and Parks
	1 continuing education
	3 unknown

Part 5 Faculty Credentials

The faculty listed below are the principal instructors in the program.

Kristel Bakker, Professor of Biology, Ph.D., South Dakota State University.

> Dr. Bakker has been at DSU since 1996. She teaches the large BIOL 101 survey course for non-majors each semester. She also teaches BIOL 221 Human Anatomy, BIOL 325 Physiology, BIOL 410 Conservation Biology, a special topics histology course and is one of the instructors for the computer instrumentation course.

Dale Droge, Professor of Biology and Academic Coordinator, Ph.D., Univ. of Illinois

> Dr. Droge came to DSU in 1992. He has taught a variety of courses over the years, but currently is responsible for the second semester of general biology (BIOL 153), the freshmen orientation course (BIOL 145), BIOL 311 Ecology, BIOL 365 Vertebrate Biology, and BIOL 450 Aquatic Biology.

Patrick Videau, Assistant Professor of Biology, Ph.D., University of Hawaii

> Dr. Videau is the newest member of the faculty in just his second year on campus. He teaches BIOL 151 General Biology I, BIOL 331 General Microbiology, BIOL 343 Cell and Molecular Biology, BIOL 371 Genetics, BIOL 422 Immunology, and SCTC 345 Bioinformatics. He also teaches CHEM 460 Biochemistry and assists Dr. Bakker with SCTC 303 Biological Instrumentation.

Nevine Nawar, Instructor of Biology, Ph.D., Univ. of Alexandria, Egypt

> On campus, Dr. Nawar teaches the second semester of the non-majors biology sequence (BIOL 103) each semester. She teaches online sections of both BIOL 101 and 103 as well as a service course BIOL 323 Anatomy and Physiology.

Gillian Berman, Instructor and Lab Manager, M.S., South Dakota State University

> Ms. Berman was hired as lab manager in 2012. She also teaches a number of BIOL 101 and 103 laboratory sections each semester.

Dr. Donna Hazelwood, Professor of Biology Emeritus, Ph.D., Cornell University, retired May 2015 after 21 years of excellent service to Dakota State University.

A vita for each faculty member may be accessed on the biology review website.

The faculty listed below teach required math and science support courses:

Rich Avery, Ph.D., Professor of Mathematics
Glenn Berman, Ph.D., Associate Professor of Mathematics

Michael Gaylor, Ph.D., Assistant Professor of Chemistry
James Maloney, Ph.D., Assistant Professor of Physics
Jeffrey Palmer, Ph.D., Professor of Mathematics
Mark Spanier, Ph.D., Assistant Professor of Mathematics
Rich Wicklein, Ph.D., Assistant Professor of Mathematics

Anticipated Changes in Staffing

With the hiring of a lab manager, staffing in the program is adequate for current enrollment. The manager assists with the ordering of supplies and equipment for the labs, setting up and taking down laboratories, as well serving as the instructor of several introductory biology lab sections. The manager also is responsible for all recordkeeping entailed in the use of chemicals, preserved specimens, or live animals in teaching exercises, and they must insure compliance with OSHA, EPA, and USDA regulations. Although the manager position has been a great help, there is still a large load on faculty to prepare for upper level laboratories such as microbiology, genetics, and molecular biology.

Since the last review, Dr. Nevine Nawar became a full-time instructor teaching the lecture and laboratories non-majors courses and the combined anatomy and physiology course. She has developed online general education biology courses which are an essential service to the online degree programs at DSU.

Faculty or Student Research

<u>Dr. Kristel Bakker</u>

Growing up in rural South Dakota has given me a deep appreciation for the prairie and a passion to further existing research on how to preserve and restore grassland habitats for wildlife. Ecosystems of the northern Great Plains have been transformed from vast mosaics of grasslands into fragmented agricultural landscapes characterized by large blocks of cropland interspersed with smaller, more isolated grassland patches. As such, we need to know how species function in these fragmented landscapes. My research interests encompass all areas of prairie ecology, but most specifically, the conservation and management of grassland birds (waterfowl, upland game and nongame species). My research projects incorporate both local and landscape level habitat variables because insights into how birds perceive grassland habitats at various scales enhances our ability to direct grassland conservation locally and over broad geographic regions.

I strongly believe in conducting applied research. Our results mean very little if they are not conveyed to habitat managers and implemented in the field. Communicating with managers to ensure the research completed meets their needs and to share our recommendations is critical to the conservation and management of species. To this end, I have consulted with state and federal government and private agencies on how to best manage habitats for nongame birds and have received funding for research projects from

the South Dakota Department of Game, Fish, and Parks, Competitive State Wildlife Grants and the States Fish and Wildlife Service. Current and past projects include nesting studies on nongame birds, waterbirds, ring-necked pheasants and waterfowl in eastern South Dakota, habitat and distribution studies of nongame birds and the burrowing owl in western South Dakota and the development of a long-term grassland bird monitoring plan for South Dakota. I collaborate with Kent C. Jensen and Charles Dieter from South Dakota State University. I completed an All Bird Conservation plan and developed a long-term monitoring plan for grassland birds of greatest conservation concern for the South Dakota Game, Fish and Parks.

Dr. Dale Droge

An important problem in eastern South Dakota is the rapid decline in water quality of lakes and streams. As an ecologist, I was attracted to trying to help improve water quality by understanding the biology of the watershed around Madison. Most of my effort has involved measuring loadings of phosphorus coming into the lakes through tributaries and storm runoff. With ecology students, I have been monitoring the invasion of buckthorn into woodlots in eastern South Dakota. I have also been involved in research in several areas of animal behavior and ecology, mostly on birds. Projects of interest have included migration and nesting patterns of birds in the local area. I have always had a fascination with the history of science especially in the areas of evolution and 19th century science, and recently have been exploring that interest. This research has led to several presentations as Charles Darwin as well as seminars about science in Victorian times. I have also has offered programs on Benjamin Franklin and the eugenics movement in America.

Dr. Patrick Videau

Cyanobacteria are photosynthetic microorganisms that generate oxygen, sequester carbon, and produce biofuels and natural products with a range of desirable pharmaceutical activities. My previous work has demonstrated that the non-toxic filamentous freshwater cyanobacterium *Anabaena* sp. strain PCC 7120 (hereafter *Anabaena*) can be an effective heterologous host to produce compounds of medical and commercial interest. Its genetic tractability, relative ease of manipulation, and minimal growth requirements (water, light, and CO_2) make *Anabaena* an attractive candidate for the study of compound biosynthesis using "green" production. Of particular interest are the fungal diterpenes for their utility as drugs, structural diversity based on cyclized scaffolds, and preliminary data showing that their scaffolds are readily produced by heterologous expression in *Anabaena*. Expression in *Anabaena* of fungal diterpene cyclases, proteins producing the cyclized scaffolds that are modified to yield the final natural product, facilitates the study of this protein class. The long-term goal is a multi-discipline collaboration to create software for predicting the diterpene scaffold from a diterpene cyclase protein sequence. Upon further refinement, such software could be used to design diterpene scaffolds for testing in pharmaceutical or industrial applications. To further develop *Anabaena* as a heterologous expression host, its capacity for diazotrophic growth will be investigated.

To continue producing compounds of interest in environments with low levels of environmental nitrogen, including places as diverse as lakes and bioreactors, *Anabaena* differentiates nitrogen-fixing heterocyst cells at regular intervals along filaments. Heterocysts are terminally differentiated, morphologically distinct cells that spatially separate the oxygen-evolving process of photosynthesis from the oxygen-labile nitrogenase enzyme complex that fixes atmospheric dinitrogen. Fixed nitrogen from heterocysts is exported to neighboring cells in exchange for fixed carbon, which allows *Anabaena* to thrive in environments lacking bioactive nitrogen. By defining two mutually dependent cell types, the interaction of positive and negative regulatory elements creates a periodic pattern along *Anabaena* filaments placing heterocysts approximately every 10 cells, thus displaying the hallmarks of a developmental system that responds to environmental cues to effect change. My lab focuses on (1) characterizing fungal diterpene cyclases using the *Anabaena* system and (2) investigating the genetic underpinnings of heterocyst differentiation to further develop this strain into a general heterologous expression host for desirable compounds. Expected outcomes include an increased understanding of heterocyst development will result in strains better suited to express desirable compounds in commercial circumstances, and genetic tools created for studying heterologous expression will contribute to the continued study of heterocyst development.

In addition to my work on cyanobacteria, I take an active interest in bringing research into teaching and collaborate with the resident chemist, Dr. Michael Gaylor, on various projects. In every semester since my arrival in 2016, I have incorporated a major primary research project into my laboratory courses – fungal isolation and characterization (Microbiology, F16), improved methods for DNA extraction from filamentous fungi (Cell and Molecular Biology, S17), assessing wax worms as a suitable host to study the pathogenesis of marine bacterial pathogens (Microbiology, F17), and investigating the genetic mechanisms underlying heterocyst function in *Anabaena* (Genetics, F18). In collaboration with Dr. Gaylor, we have assessed the phytochemical inventoried of extrafoliar nectaries of *Sansevieria* sp. (Mother-In-Law's Tongue plant), investigated the volatilome and functional microbial physiological profile from land-applied sludge, and defined the total compounds present in thermally-printed receipts. Ongoing projects include determining the kinetics of anthraquinone formation from anthracene under plausible prebiotic conditions, investigating the bacterial and chemical contents of a 98-year-old jar of preserved pumpkin, and validating a technique to study the volatile organic compounds evolved from sealed jars of stored food products. All of these lines of inquiry have or will be presented at local, national, or international conferences by the student researchers. These projects have already resulted in one accepted publication in the *Journal of Chromatographic Science* with a student co-author (Hope Juntunen, Goldwater Scholar), another under review in the journal *Molecular Microbiology* with a student co-author (Vaille Swenson), and at least six more manuscripts in preparation.

Biology faculty are actively involved with student research projects. Many of these projects are listed in Appendix B.

Service to Community

Dr. Bakker has served on several DSU committees including: Assessment, Secondary Education Coordinating, Professional Education Coordinating, Human Subjects, Faculty Research, Animal Care and Use, Grade Appeal, Readmission, Search committees for the Vice President of Academic Affairs and Dean of the College of Arts and Sciences as well as Biology, Exercise Science, Chemistry and Physics faculty positions. Additionally, she has been a member of several Master's (SDSU) and Ph.D. Program Committees (USD, SDSU). Professionally, she serves as a peer referee for several journals, shares her research results with public agencies and belongs to several professional organizations. Kristel was the treasurer and an executive board member of the South Dakota Academy of Sciences from 2001-2008 and is previous executive board member of the South Dakota Ornithologists' Union. She is currently on the steering committee for the South Dakota Grassland Coalition Bird Tour and the South Dakota Breeding Bird Atlas Technical Committee. Dr. Bakker has taught bird identification at the South Dakota Game, Fish and Park's Becoming an Outdoor Woman workshops, leads educational activities at local state parks and for elementary students and shares her research with high school students.

Dr. Droge is co-chair of a newly formed General Education Committee and serves as one of DSU's representatives to the state-wide general education group that includes all of the public universities in South Dakota. He is a member of the campus faculty development committee and is the academic coordinator for math and science programs within the College of Arts and Sciences. He is a former member of the Board of Directors of the Collaboration for the Advancement of College Teaching and Learning. This organization promotes faculty development programming throughout a five state region in the upper Midwest. Dr. Droge is a member of the South Dakota Ornithologists' Union (former director) and the South Dakota Academy of Sciences. He is an appointed member of the City of Madison Parks and Recreation Advisory Board and a representative to the Lake County Watershed Improvement Committee. He conducts a number of nature and other science programs for the Madison School district and other public groups.

Dr. Videau has severed on the Diversity Committee at Dakota State University (DSU) and a Physics Faculty search and screening committee. He also is a favorite of the Admissions Office to meet with interested students and represent DSU during recruitment visits. Professionally, Dr. Videau serves as a reviewer for six different journals and regularly edits the work of his colleagues. He maintains several active collaborations with researchers at other institutions and regularly presents research findings at conferences, most commonly held by the American Society for Microbiology, the South Dakota Academy of Sciences, and the American Chemical Society. He is a member of the American Society for Microbiology and the American Association of Undergraduate Women

Part 6 Academic and Financial Support

Resources providing academic support to faculty and students in Biology include the Karl E. Mundt Library, a wireless computer infrastructure, and classrooms and laboratories equipped with computer projection systems.

Karl E. Mundt Library and Learning Commons

The Karl E. Mundt Library provides a wide range of library services as well as a diverse collection of reference and informational materials for the use of the faculty and staff of Dakota State University. The Library exists to serve as an archive of accumulated knowledge, a gateway to scholarship, and a catalyst for the discovery and advancement of new ideas. In fulfilling its obligation to provide knowledge to the University and the scholarly community at large, the Library collects, organizes, and provides access to recorded knowledge in all formats. The Library faculty initiates discussions and proposes creative solutions to the information challenges facing the University and the scholarly community. The Library's faculty and staff actively participate in providing quality service, access, instruction, and management of scholarly information. It is one of the main sources of knowledge and reference for students in mathematics.

The mission of the Karl E. Mundt Library is to meet the information needs of the students, faculty, and staff of Dakota State University and to support the University's stated mission and goals. The college and library faculty work together to plan the development of library resources in order to purchase the most appropriate materials to achieve the educational objectives of Dakota State University. The total collection contains approximately 65,000 physical items as well as 130 periodical databases (the vast number of which are full-text) and covering every discipline.

The Karl E. Mundt Library boasts wide ranging and easy access to the resources needed by anyone pursuing a science related research topic. While the library does not have an extensive list of physical books related to biology, the Library subscribes to large collections of electronic books, and in addition many items are readily obtainable through interlibrary loan. In addition, the Library subscribes to MathSciNet, which provides access to 1800 journals featuring 3.5 million publications.

These and additional resources are available through a variety of means: the Library Catalog, EBSCO Academic Search Premier, ProQuest Research Library, Statista, and Lynda.com. In short, there is little the Library cannot acquire to fill student or faculty needs.

Computer Infrastructure

Each faculty member is provided with a laptop computer either a Fujitsu tablet PC or a MacBook Pro depending on preference. Memory or other special upgrades and accessories may be requested. A new initiative seeks to replace faculty computers every three years.

Within the unit of Computing Services, the Network Services group is responsible for planning, implementing, and securing network services for campus computing resources. A number of servers provides applications hosting home directories, web space, e-mail, and other central applications.

Working in partnership with the colleges and the institution's academic support areas, Network services develops the image of applications installed in each computing laboratory. Network Services operate a Repair Center, staffed primarily by students, to quickly respond to any computing or network access problems in campus offices or computing laboratories.

Advisory and Support Staff

Nancy Presuhn, Senior Secretary for the College of Arts and Sciences
David Overby, Vice-President for Technology and CIO
Craig Miller, Senior Systems Programmer, Computing Services
Tyler Steele, Communication Network Specialist, E – Education Services

Financial Support

There are two sources of funds that support the biology program. State funds are allocated to the College of Arts and Sciences and are used for general operating expenses of the Science Center and support of instruction including printing, office supplies, and some support of travel. The funds in this account are shared by all disciplines in the college.

In addition to the resources available through state funds allocation, a discipline fee of $20 per credit hour is assessed for each student taking a science course. These lab fees are placed in a local account and support courses in Biology and Physical Science. The amount of fees placed into the local counts averages about $35,000 per year. Funds that remain in the lab fees account at the end of the fiscal year are placed in a reserve account. The academic coordinator in the Science Center supervises both accounts.

Additional support for professional development and training is provided from funds allocated through the Vice-President for Academic Affairs office. Faculty apply for support and up to $1000 per year is available for each faculty member.

Budget for Math and Science Programs 2009 - 2016

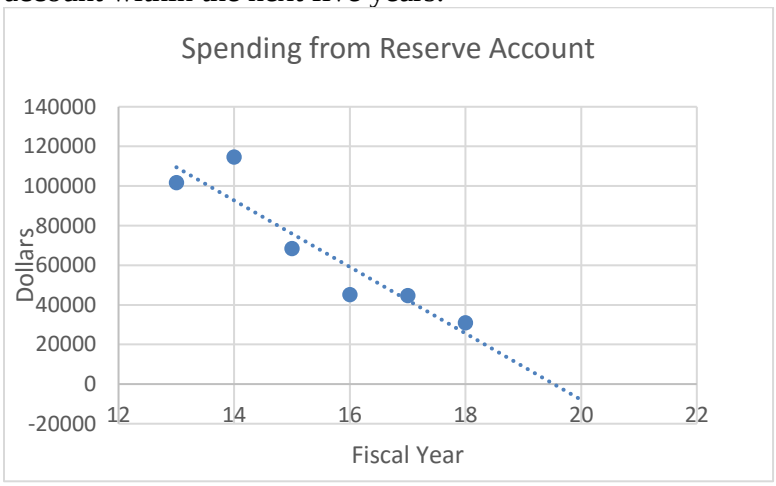
Fiscal Year	State Funds	Local Funds
2009	120,106**	$30,700
2010	$66,600	$30,000
2011	$63,850	$57,000*
2012	$61,858	$32,000
2013	$61,640	$32,000
2014	$70,060***	$88,400*
2015	$59,507	$58,440*
2016	$57,600	$43,386

*reflects funds transferred from previous carry over science funds to purchase equipment.
** funding of audio purchases
*** one-time budget request for the SDCAA (South Dakota Art Association Conference).

The year to year variability in local funds reflects amounts transferred from the carryover reserve saved from previous years. For years prior to this review period, the science programs were controlling expenditures to build up the carryover reserve account. Beginning in 2015, major equipment was purchased to upgrade the teaching labs and support research opportunities and support the research and teaching initiatives of a new faculty member (Dr. Videau).

Fiscal Year	Carryover Reserve
2013	$101,699
2014	$114,617
2015	$ 68,313
2016	$ 45,102
2017	$ 44,574
2018	$ 30,937

Clearly this level of withdrawal from the reserve account is not sustainable for many more years. The graph below shows that the rate of spending will exhaust the reserve account within the next five years.



Major financial concerns

It is expected that state support of the College of Arts and Sciences, and therefore of the biology program, will continue at current levels. Lab fees are generally adequate to fund the costs of basic supplies for classroom activities and low-cost equipment. However, to support the goal of increasing undergraduate research, the program has asked for more funding.

Increases in Annual Lab Budget to Support Student Research Initiatives:

Lab Consumables	$ 10,000
Analytical Grade Gases	$ 2,000
Summer Student Stipends	$ 15,000
Total	$ 27,000

Part 7 Facilities and Equipment

Ruth Habeger Science Center

In 2010, a 5 million dollar extensive renovation of the DSU Science Center was completed. The building did not increase in size, but every room was remodeled and updated. Faculty offices moved to the outside of the building and classrooms were added to the central area. The following statements describe rooms of the Science Center that are frequently used by the biology program faculty and students (floor plan diagram can be found at end of this section):

Advanced Biology Lab Room 101 (1215 sq. ft.)

Upper division laboratory courses are taught in this space such as microbiology, cell and molecular biology, and genetics. The benches are equipped as individual work stations with gas jets, drawers, and access to sinks. Equipment in the room includes a laminar flow hood, a -80 C freezer, two refrigerators, 4 incubators, and a specialized growth chamber for cyanobacteria. Safety precautions like eyewash stations and showers are incorporated into the design of this and all the other laboratory rooms.

Biology Preparation and Storage 102/103 (512 sq. ft.)

A combined chemical storage and preparation room is located between the two chemistry labs. A large free-standing autoclave is located here. About a third of the room is separated by a door and is designed to be used for research projects.

Non-Majors Biology Laboratory Room 106 (1215 sq. ft.)

This room is primarily used for laboratory sections of non-majors biology (BIOL 101 and 103). This is usually 6-7 three hour sections.

Greenhouse 108 (468 sq. ft.)

A heated greenhouse is attached to the building next to Room 106. Plants for demonstration are grown here and many courses grow plants for experiments such as a plant competition study in ecology.

General Biology Laboratory Room 109 (1575 sq. ft.)

General Biology and many upper division biology courses including anatomy, physiology, ecology, and vertebrate biology are taught in this spacious room. Not only laboratory sections, but lecture sessions are conducted in this space. This allows a blending of lab and class activities. Most of the anatomy materials and organismal diversity collections are housed here.

Environmental Biology lab, Preparation and Storage 111/112 (712 sq. ft.)

This room is set up for water quality testing and other environmental laboratory activities. There is a door to the outside that facilitates sample transportation. Room 111 has a large laboratory refrigerator, a consumer grade freezer and drying ovens. Room 112 has a laboratory hood and dishwasher along with shelving for equipment storage.

Advanced Chemistry Lab 139 (1110 sq. ft.)

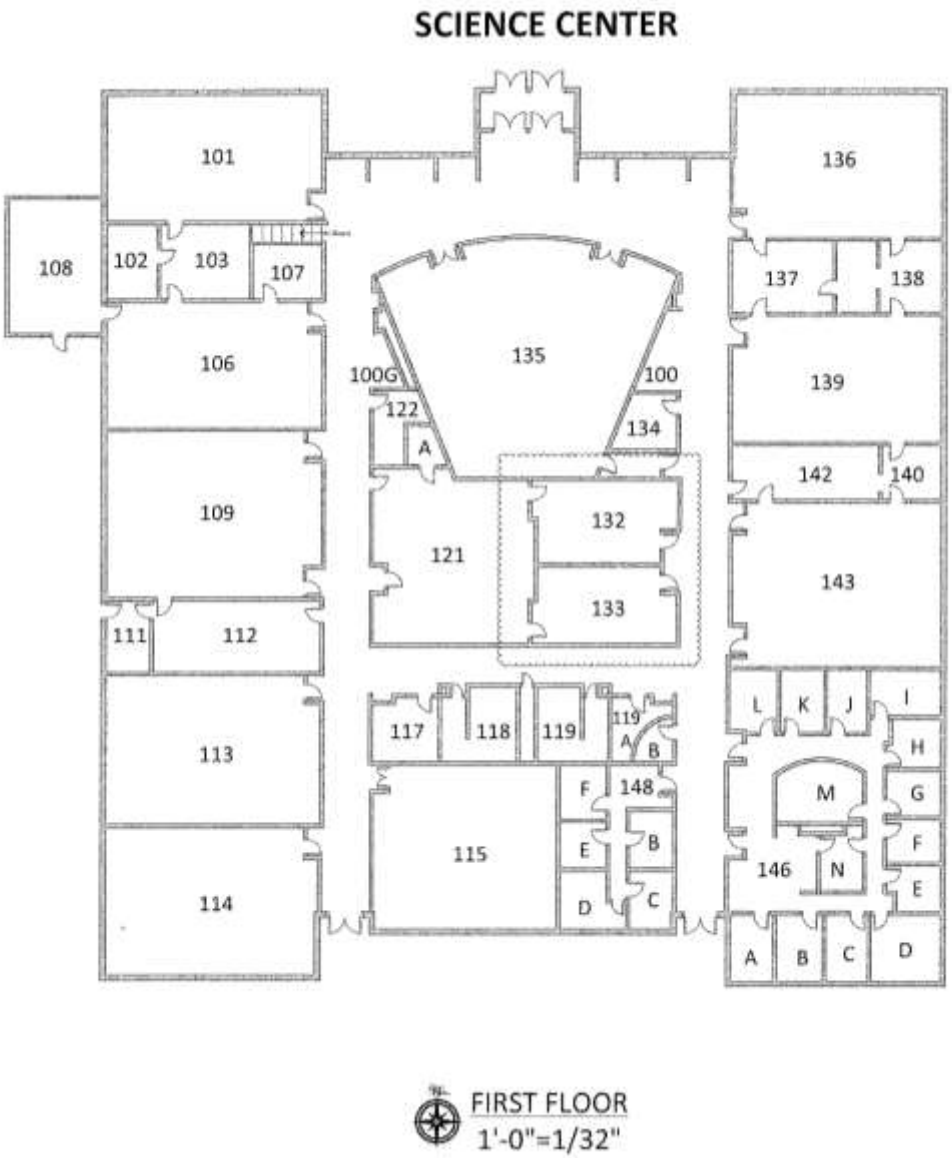
Upper division courses such as organic chemistry, analytical chemistry and biochemistry are taught in the this specialized lab. In collaboration with chemistry professor Dr. Michael Gaylor, Dr. Videau and many biology students use this room for research projects. Large amounts of open counter space can be used for almost any specialized experimental apparatus and large fume hoods line one of the walls. Storage area and bench space is available for individual student research projects. Analytical balances, an ice machine, and other specialized equipment are located here. A room with a heavily used GC/MS opens off the rear of this laboratory.

Conference Rooms 132 and 133

These two rooms are designed to be used for a variety of purposes. Faculty, staff and student groups schedule meetings here and specialized courses such as seminars and discussion groups often are conducted in these rooms.

Auditorium SC 135

Larger courses such as introductory biology, chemistry, physics are taught here as well as anatomy and several courses from other disciplines in the College of Arts and Sciences. Tables in front of the more than one hundred seats facilitate computer use along with an abundance of electrical outlets. Students enjoy the comfortable seating and excellent sight lines provided by the gently sloping floor. A multimedia projector gives a large, high resolution image and the theater surround sound system and specialized design features provide an excellent acoustic environment.



Quality of the Facilities

After the remodeling project, the facilities are very good.

Additional Facilities Needed

With increasing faculty and undergraduate research, more spaces dedicated to those efforts would be beneficial.

Quality of Current Equipment

Most of the current equipment is in good condition and works reasonably well, but maintenance and eventual replacement of some of the more expensive instruments is a concern.

Capital Equipment

Computer equipment for classroom and lab:

Computer interfaces, software, and data probes (Vernier)

Projectors mounted in all biology classrooms and laboratories

Projection capable compound and dissecting microscopes

Compound and dissecting microscopes with digital cameras

Available for Faculty Use:

Networked laser printer/copier/scanner located in the Science Center office complex.

Biology Laboratory Equipment

See list in Appendix D.

Quality of Current Equipment

The strategic plan to purchase more equipment after the remodeling of the building has significantly increased the quality and quantity of more modern equipment in the teaching laboratories. Much of the equipment is in reasonable condition, but increased use has also led to a problem in keeping all items in good working condition. There have been several expensive repairs and service visits required in the last three years. The biology program has asked for line-item funding to provide for service contracts and ongoing maintenance of major equipment. The increasing demands of keeping equipment serviceable cannot be adequately funded with the current level of allocation.

<u>Service Contracts and Maintenance:</u>

GCMS Service contract	$ 12,500
GCMS Replacement Parts	$ 5,000
Autoclave Servicing	$ 500
Microscope Servicing	$ 800
Balance Calibration	$ 200
Total	$ 19,000

Additional Equipment Needed

It would be difficult to obtain all the equipment that could be used, but some equipment needs to be purchased to further the research programs of faculty and the computer-integration mission of the university.

Equipment for Research Initiatives:

HPLC	$50,000
Fluorescence Microscope	$35,000
HP Gas Chromatograph	$ 3,000
Total	$88,000

Part 8 Assessment and Strategic Plans

Goals and Objectives of the Biology Program

Goal 1. Graduates will have a basic knowledge of the principles of biology.

a. Graduates will understand the important concepts and methods of the major disciplines within biology.

b. Graduates will have a basic knowledge of the history and philosophy of science and will understand the ethical and humanistic implications of the practice of science including issues in biology that are controversial in nature.

Goal 2. Students will be able to use their knowledge of concepts in biology to solve new problems.

a. Students will understand the process of science including the basic steps of the scientific method and use this ability to conduct research in biology.

b. Graduates will think logically and be experienced problem solvers.

Goal 3. Have a high degree of proficiency in the use of computer technology.

a. Students will be proficient users of computer technology to find information, acquire and analyze data, and communicate results and conclusions.

b. Graduates will be able to successfully use technology in their post-graduate career:

Goal 4. Students will be able to communicate their knowledge and results effectively for a wide range of purposes and intended audiences.

a. Graduates can effectively communicate information in writing.

b. Graduates are effective speakers communicating information to a variety of audiences.

Assessment of the Goals and Objectives of the Biology Program

Assessment of program quality and student outcomes is an important component of program enhancement in the Biology Program at Dakota State University. A faculty member is appointed to coordinate assessment activity for each degree program at DSU. Dr. Droge is the coordinator for Biology for Information Systems. The biology faculty developed a plan with several assessment activities for each major that are assessed by multiple criteria. The common set of assessment measures used include course grades, national exams, graduate surveys, employer surveys and exit interviews. The faculty meet annually to review assessment data and make recommendations for improvement, if necessary.

Major Field Assessment Activities

Major	Type of Program	Standardized Exams	Exit Interviews	Research Projects	Course Grades	Placement Statistics	Graduate Survey	Employer Survey
Biology for Info. Systems	4- year	X	X	X	X	X	X	X

The complete assessment plans, summary analysis and changes for improvement through 2013 graduates are available at

http://public-info.dsu.edu/academic-assessment/major-field-undergrad-table/

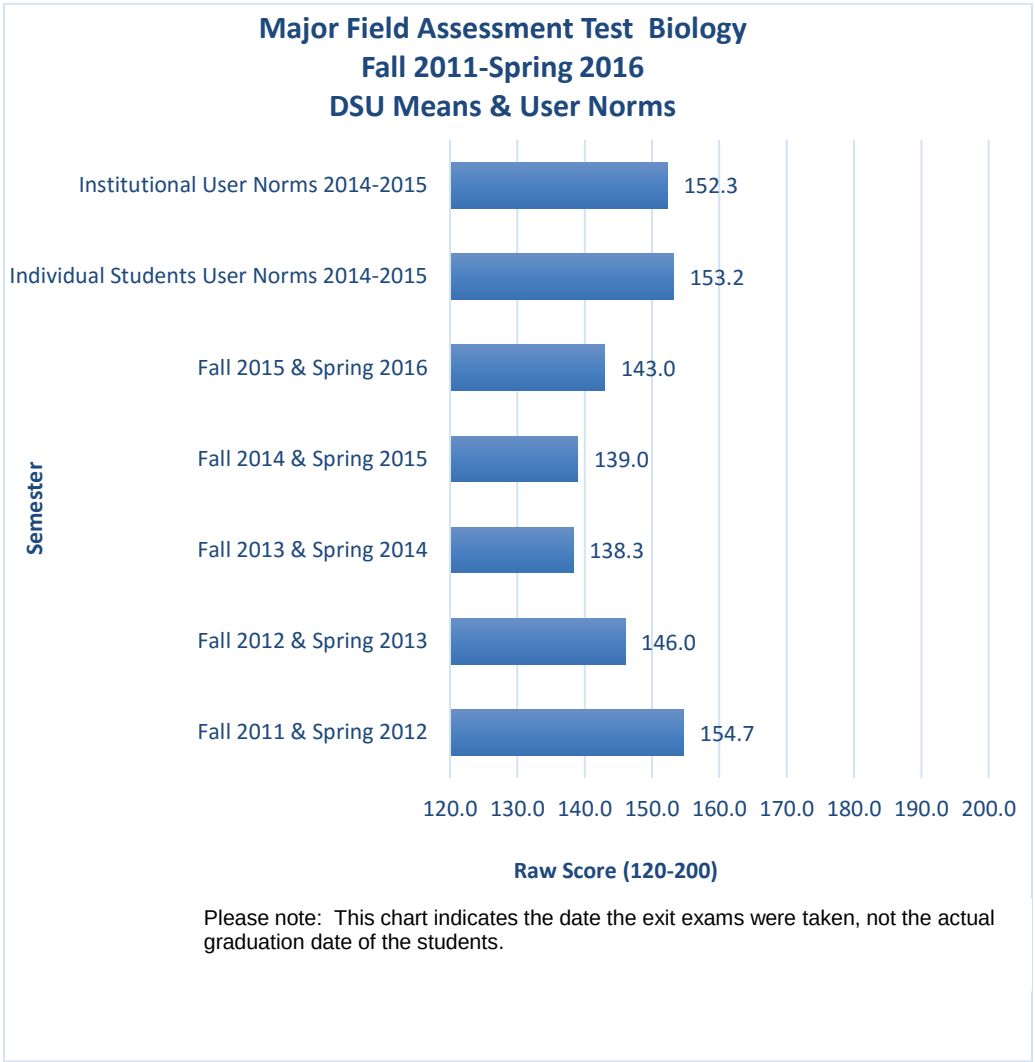
In 2015, we began a process of revising program assessment activities. The measures outlined above had been collected for over 10 years. While the data clearly showed that students were generally meeting benchmarks and student satisfaction was high, the information was not really providing new information about ways to improve the program.

To begin the process of revision, the biology faculty developed a curriculum map that indicated places where the goals and objectives of the program were introduced, reinforced or mastered (map located in Appendix E). The faculty are currently preparing appropriate assessment activities that will provide direct measures of student achievement of learning outcomes. We are still in the early stages of revising the assessment plans, but we hope that the changes will provide better evidence of where successes are occurring and, also where improvement is needed.

In a similar manner, science faculty at Dakota State are developing ways to directly measure learning outcomes of general education goals. This is part of a Board of Regents initiative. The science courses are slated to begin collecting assessment data in selected general education courses beginning in the fall 2018 semester.

Major Field Exit Exam for Program Assessment

Students who apply to graduate are required to complete an exit exam in their field of study. Students complete the exam in the semester they plan to graduate. (Summer graduates participate in the assessment activity in the spring semester.) DSU administers the biology exam developed ETS to students graduating to assess the effectiveness of the biology program. More about the exam content, validity, and comparative data can be found at: https://www.ets.org/mft/about/content/biology.



Strategic Planning

Strategic Plan of Dakota State University

Dakota State University is a public, mission-driven institution. It is South Dakota's designated information technology university and is a leader in integrating this technology into the academic disciplines of its curriculum. Academic rigor and the infusion of information technology into teaching, research, and creative activity are at the heart of the university's work.

A strategic plan Excellence Through Innovation 2020 was recently developed:

https://dsu.edu/assets/uploads/resources/Strategic-Plan.pdf

Appendix A – Biology Degree (Catalog Description)

Students majoring in this program will be prepared to become employees for the science-based industries, medical fields, and agencies that use modern technology. This program provides an excellent background in computer science/information systems technology as well as a solid foundation in biology, supporting sciences, and mathematics. The graduates of this program will be capable of problem solving and developing marketing strategies for products of research and service in the science-based information industries, such as the biotechnology industry where a background in science and technology, is increasingly necessary. This program also provides an excellent foundation for persons wishing to pursue a specialized professional career such as medicine, dentistry, etc. or to obtain advanced education in the health fields or biological science.

Note: DSU has an articulation agreement with SDSU for students who have completed a bachelor's degree in Biology who wish to apply to the accelerated nursing program at SDSU and obtain a Bachelor of Science in Nursing (BSN) degree.

System-wide General Education Requirement (30 Credits)

Majors must take BIOL 151/151L and BIOL 153/153L as part of the System-wide General Education Requirement.

Biology Component (40 Credits)

BIOL 145 - Introduction to Scientific Inquiry 1 credit
BIOL 221 - Human Anatomy 4 credits
BIOL 221L - Human Anatomy Lab 0 credits
BIOL 280 - Inquiry and Analysis in Biology 1 credit
BIOL 280L - Inquiry and Analysis of Biology Laboratory 1 credit
BIOL 311 - Principles of Ecology 4 credits
BIOL 311L - Principles of Ecology Lab 0 credits
BIOL 331 - Microbiology 4 credits
BIOL 331L - Microbiology Lab 0 credits
BIOL 343 - Cell and Molecular Biology 4 credits
BIOL 343L - Cell and Molecular Biology Lab 0 credits
BIOL 371 - Genetics 4 credits
BIOL 371L - Genetics Lab 0 credits
BIOL 498 - Undergraduate Research/Scholarship 1-12 credits (2 credits required)

Choose 15 credits from the following (15 Credits)
BIOL 325 - Physiology 4 credits
BIOL 325L - Physiology Lab 0 credits
BIOL 365 - Vertebrate Zoology 4 credits
BIOL 365L - Vertebrate Zoology Lab 0 credits
BIOL 410 - Conservation Biology 3 credits
BIOL 422 - Immunology 3-4 credits (3 credits required)
BIOL 422L - Immunology Lab 0-1 credits

BIOL 450 - Aquatic Biology 4 credits
BIOL 450L - Aquatic Biology Lab 0 credits
BIOL 492 - Topics 1-5 credits *
*May be repeated provided student does not enroll in the same topics course. One credit Biology topics offering may not be combined to substitute for a required or elective three-or four-credit Biology course.

Math and Science Core Support Courses (23 Credits)

Note: Students planning to pursue a career in medicine or health professions are encouraged to take CHEM 326, CHEM 460, CHEM 492, MATH 125 or MATH 201, PHYS 211 and PHYS 213.

CHEM 112 - General Chemistry I 4 credits
CHEM 112L - General Chemistry I Lab 0 credits
CHEM 114 - General Chemistry II 4 credits
CHEM 114L - General Chemistry II Lab 0 credits
MATH 281 - Introduction to Statistics 3 credits

Choose 12 credits from the following (12 Credits)
CHEM 326 - Organic Chemistry I 3 credits
CHEM 326L - Organic Chemistry I Lab 1 credit
CHEM 328 - Organic Chemistry II 3 credits
CHEM 328L - Organic Chemistry II Lab 1 credit
CHEM 332 - Analytical Chemistry 3 credits
CHEM 332L - Analytical Chemistry Lab 1 credit
CHEM 460 - Biochemistry 3 credits
CHEM 492 - Topics 1-4 credits
EXS 350 - Exercise Physiology 3 credits
EXS 350L - Exercise Physiology Lab 1 credit
EXS 353 - Kinesiology 2-3 credits
HIM 130 - Basic Medical Terminology 2 credits
HLTH 422 - Nutrition 3 credits
MATH 123 - Calculus I 4 credits
MATH 125 - Calculus II 4 credits
MATH 418 - Mathematical Modeling 3 credits
PHYS 111 - Introduction to Physics I 4 credits
PHYS 111L - Introduction to Physics I Laboratory 0 credits
PHYS 113 - Introduction to Physics II 4 credits
PHYS 113L - Introduction to Physics II Laboratory 0 credits
PHYS 211 - University Physics I 4 credits
PHYS 211L - University Physics I Laboratory 0 credits
PHYS 213 - University Physics II 4 credits
PHYS 213L - University Physics II Laboratory 0 credits

Science Technology Courses (15 Credits)

CSC 105 - Introduction to Computers 3 credits
ENGL 379 - Technical Communication 3 credits
SCTC 303 - Introduction to Biological Instrumentation 3 credits
SCTC 345 - Introduction to Bioinformatics 3 credits

Choose one course from the following (3 Credits)
CIS 123 - Problem Solving and Programming 3 credits
CIS 130 - Visual Basic Programming 3 credits
CSC 150 - Computer Science I 3 credits

Social Science Course (3 Credits)

Select a course from the Social Science course listing with prefix ANTH, HIST or SOC that is not already being used to satisfy general education requirements.

Electives (9 Credits)

Two of these electives will have been met upon completion of BIOL 151/151L and BIOL 153/153L as part of the system general education requirement.

Appendix B: Undergraduate research projects 2010-2016.

Under the direction of Dale Droge:

2010 - Joshua Huju – Bird Identification and Line Stride Protocols for East River Power Cooperative.

2011 – James Farrell – Phosphorus levels of streams and lakes near Madison, SD.

2012 – Anthony Boddiker – Measurement of plant growth under different fertilizer compositions

2013 - Andy Coy – Comparison of lactate threshold and level of perceived exertion.

Taylor Boyte – Detection of chlorophyll content in different grades of olive oil by spectrophotometry.

Sean Johnson – Effect of habitat structure on zooplankton abundance.

2014 – Weston Dauz – Using Fold It software program to study protein structure.

Courtney Hamblin – Phosphorus levels in tributaries and lakes in Lake County, SD.

Lena Ksiazek – Phosphorus levels in surface run-off.

Thomas Mettler – Orientation of dogs during defecation in relation to the magnetic field.

2015 – Cassie Jacobsen – Effect of barometric pressure on calving patterns.

Jessica Selland – Influence of age on vulnerability to concussions.

2016 – Anastasia Gentles – Effect of age in prolapsed cows.

Katherine Gonzalez – Tree inventory of DSU campus.

Ian Nelson – Response of crickets to sewage sludge and soil.

Ellie Kristensen – Phosphorus levels in tributaries and lakes in Lake County, SD

Justin Summers – Effect of cover crops on nutrient run-off.

Grace Estridge – Survey of American Burying Beetle populations in Madison, SD.

Under the direction of Donna Hazelwood:

2010- Rachel Jensen - Antibiosis of Leaves of Specific Plants on Selected Bacteria

Holli Plagman Williams - Effectiveness of Different Colored Inks on Staining Mycorrhizae in Various Plants.

Zach Williams - Effects of Common Pharmaceuticals on Plant Growth**.**

2011 – Rebecca Zens - Detection of Nosema in Honey Bee Hives.

2013 - Clarissa McClanahan - Vermicomposting with *Eisenia fetida* to Determine the Best Substrate for a Vermiculture

Amber Johnson - Examination of Antibiotic Resistance in *E. coli* from Lake County SD and Lab Strain B".
DSU grant recipient, and DSU representative to SD Legislative Poster Session and presentation South Dakota Academy of Science

Ryan Twombley – Role of NAMPT in cancer pathology. Research through Sanford Health REU program.

2014 - Taylor Mosco – Examination of the efficacy of cleaning products used in a long term care facility against two bacterial isolates.

Lucas Dolan – Examination of antibiotic resistance in E. coli from Redfield Slough, Lake County, SD and lab strain W3140.

2015- Markie Hanisch – Investigating water-borne coliforms and E. coli lab strains resistance to antibiotics.

Alexis Miller – Examination of antibiotic resistance of E. coli from Long Lake, Lake Co., SD.

2016 – Jessica Zylla – Characterization of rare pediatric diseases Ataxia Telangectasia (AT) in pigs. With Sanford Health REU program.

Under the direction of Kristel Bakker:

2010 - Brian Bolin - Feeding Habits of Game Fish in Mille Lacs Lake from Spring to Late Summer

2014 - Peter DeGroot - Detection of Grassland Songbird Species in Relation to their Proximity to Roads.

2015 - JD Farley- Age and Growth of Rock Bass from Deerfield Reservoir.

2016 – Tracy Halouska - A comparison of Great Horned and Screech Owl Habitats

Allison Thielsen – Effect of ice on body's natural healing system.

Sarah Friedel – Relationship of sugar in soda and cavities.

Ridge Lindberg - White-tailed deer travel patterns throughout the fall

Walker Ruhd - Do oxygen levels have an impact of fish size and number?

Justin Templeton - Factors correlated with job satisfaction in certified nursing assistants.

Under the direction of Michael Gaylor (Assistant Professor of Chemistry):

Kayli Rageth – Plausible prebiotic assembly of a primitive genetic molecule from meteoritic nucleobases and reduced phosphorus on the primordial Earth.

Michele Rogers – Forensic screening analysis of hazardous chemicals present in cash register receipts collected around Dakota State University.
DSU grant recipient, and DSU representative to SD Legislative Poster Session and presentation South Dakota Academy of Science

Appendix C: Biology Advising Check Sheet

ADVISING CHECKSHEET

Biology for Health Professions

EFFECTIVE CATALOG YEAR 2017-18

Sample Schedule (subject to course rotations)

* Required for all health professions programs

** Required by Medical, Dental, Veterinary and many other programs'

\+ Recommended by most health professions programs

First Semester (Fall)	CR	Second Semester (Spring)	CR
BIOL 145-Intro to Sci. Inquiry	1	BIOL 153 General Biology II *	4
BIOL 151 General Biology I*	4	ENGL 101 Composition I	3
CHEM 112 General Chemistry I *	4	CHEM 114 General Chemistry II*	4
MATH 102 College Algebra (some programs require	3	Social Science (Psychology) +	3
MATH 123 Calculus I) *		CSC 123 Prob. Solving or CSC 150 Comp. Science or	3
CSC 105 Intro to Computers	3	CIS 130 Visual Basic	
Total Credits	**15**	**Total Credits**	**17**
			32

Third Semester	CR	Fourth Semester	CR
BIOL 331 Microbiology	4	BIOL 221 Human Anatomy	4
CHEM 326 Organic Chemistry I*	3	BIOL 281 Inquiry and Analysis in Biology	2
CHEM 326L Organic Chemistry I Lab*	1	CHEM 328 Organic Chemistry II**	3
Arts and Humanities	3	CHEM 328L Organic Chemistry II Lab**	1
Social Science (Sociology)+	3	SPCM 101 Oral Communications	3
		MATH 281 Statistics*	3
Total Credits	**14**	**Total Credits**	**16**
.			**30**

Fifth Semester	CR	Sixth Semester	CR
BIOL 311 Ecology	4	BIOL 371 Genetics	4
BIOL 325 Physiology+	4	CHEM 450 Biochemistry+	3
PHYS 211 University Physics I*	4	SCTC 303 Intro to Biological Instrumentation	3
ENGL 201 Composition II	3	PHYS 213 University Physics II*	4
		Arts and Humanities	3
Total Credits	**15**	**Total Credits**	**17**
			32

Seventh Semester	CR	Eighth Semester	CR
BIOL 422 Immunology	3	BIOL 343 Cell Molecular Biology	4
BIOL elective	4	BIOL 498 Undergrad. Research	2
Math/EXS/HIM/HLTH/MATH/PHYS elective (4)	3	CHEM 332 Analytical Chemistry	3
Social Science (ex. Abnormal Psychology)+	3	CHEM 332L Analytical Chemistry Lab	1
		SCTC 345 Bioinformatics	3
		ENGL 379 Tech Communications	3
Total Credits	**13**	**Total Credits**	**16**
			29

Appendix D: Biology Lab Equipment

Item	Quantity
Microscope, binocular, w/ digital camera	9
Microscopes, Reichert binocular	18
Microscopes, American optical monocular	28
Microscopes, binocular dissecting	15
Microscope, dissecting w/ digital camera	1
Centrifuge, benchtop	4
Centrifuge, tabletop	1
Incubators, 20-75 C	4
Ultra Low Freezer (-80 C)	1
Temperature- controlled, lit incubator with CO_2	1
Autoclave, Primus	1
pH meter, Sargent Welch digital	1
Electrophoresis rigs (polyacrylamide and agarose)	4
Thermocycler	2
U-V Visible kinetic spectrophotometer,	1
Oven, gravity, convection	2
Chest freezers (-20 C)	2
Double-door laboratory refrigerator	1
Water bath, thermostatic	3
Balance top loading	6
Hood, laminar flow	1
Vortex mixers	8
Benchtop MilliQ water system	1

Equipment in Chemistry Lab Frequently Used by Biology:

Item	Quantity
Analytical Balance with 0.0001 g accuracy	1
GC-MS (electron impact only)	1
Supercritical fluid extractors	2
Research quality dissecting microscope	1
Ice Machine	1

Appendix E: Program Assessment Plan

I = Concepts and skills for the outcome **introduced**.
R = Concepts and skills for the outcome **reinforced**.
M = Concepts and skills for the outcome **mastered**.

Biology students will:	Gen Biol I	Gen Biol II	Human Anatomy	Inquiry and Analysis	Ecology	Physiology	Microbiology	Biol Instrumentation	Cell and Molecular	Genetics	Vertebrate Biology	Conservation Bio	Imumunology	Aquatic Biology	Bioinformatics	Undergrad Research
Goal 1. Have a basic knowledge of the principles of biology. a. Important concepts and methods of the major disciplines within biology.	I	I	R		R	R	R		R	R	R		R	R	R	M
b. History and philosophy of science				I				R								M
c. Ethical and humanistic implications of the practice of science including issues in biology that are controversial in nature.	I	I			R				M	R	R	M		M		
Goal 2. Use their knowledge of concepts in biology to solve problems. a. Understand the process of science including the basic steps of the scientific method and use this ability to conduct research in biology.	I	I		R	R			R		R			R	R	M	M
Goal 3. will be proficient users of computer technology to find information, acquire and analyze data, and communicate results and conclusions.				I	R	R		R	R					R	R	M
Goal 4. Students will be able to communicate their knowledge and results effectively orally and in writing			I	I			R	R			R	R		R		M