

# **Self-Study**

## **Biology Program Review**

**College of Arts and Sciences**  
**Dakota State University**  
**April 24, 2009**

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## **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, and 9th on the Baccalaureate II list in 2000.

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

## **Institutional Mission Statement**

Dakota State University is 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 elementary and secondary teachers with expertise in the use of computer technology and information processing in the teaching and learning process. A secondary purpose is to offer two-year and one-year programs and short courses for application and operator training in areas authorized.

## **College Mission**

The College of Liberal Arts and the College of Natural Sciences were merged in July, 2003. The College of Arts and Sciences offers a variety of programs and courses leading to many successful careers. Computer technology is integrated throughout all majors. The College offers the vast majority of the general education courses that serve 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 Respiratory Care are located at McKennan and Sanford Hospitals in Sioux Falls.

The College of Arts and Sciences offers degree programs in Biology, Computer Game Design, Digital Arts and Design, English, Mathematics, Physical Science, Scientific Forensic Technology, 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 such as chiropractic medicine, dentistry, divinity, engineering, law, library science, medicine, medical technology, mortuary science, nursing, optometry, pharmacy, physical therapy, and veterinary science.

The Biology for Information Systems and Biology Education degrees were established at the time of the institutional mission change. These degrees fit well with the defined focus of DSU on computer integration into the curriculum and serve the needs of the K-12 education community. 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. Nonetheless, the degree to which computers have been integrated into all courses in the biology curriculum has greatly increased over the last two decades. This trend will continue with greater use of computer related technology for a variety of course exercises including internet activities, data acquisition and analysis, simulations and presentations.

As an example of the changing technology, DSU is implementing 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.

**Date of last biology program review**

The date of the last institutional program review was April 2004.

**Outcomes of the last biology program review**Trends in the Discipline

Dr. Burk, the external reviewer for the Biology Institutional Program Review, suggested that currently biology is one of the fastest-changing academic disciplines. In addition to the continuation of research in the fields of evolution, ecology, and physiology, there has been tremendous growth in molecular and cellular biology, which includes the areas of genomics, proteomics, and bioinformatics. Therefore, biology graduates need strong backgrounds in physics, chemistry, and mathematics as biological research becomes more interdisciplinary. Also 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.

DSU's Biology program was praised for responding well to many of these trends with the potential for fuller response to others. While the curriculum is fairly traditional, teaching approaches within the traditional courses have been creative and innovative. Dr. Burk commended the DSU Biology department for its special topics courses which address many "science and society" issues and are "exemplary in the way they integrate scientific, mathematical, and computational approaches into focused investigatory efforts."

Dr. Burk stated that while the molecular/cellular component of the Biology program has been strengthened since the last program review in 1997, this area of study needs a stronger place in the DSU curriculum, particularly in providing students with familiarity in molecular techniques, approaches, and information.

Academic Programs and Curriculum

The external reviewer recognized DSU's Biology department as providing courses for a large number of non-majors including students fulfilling general education requirements, and students in Exercise Science, Respiratory Care, and Health Information Management programs. The faculty in these areas generally expressed satisfaction, although a suggestion was made that a single-semester Anatomy and Physiology course was too limiting.

Dr. Burk suggested several changes in the Biology curriculum and course offerings that might address both the recruitment and retention challenges. He noted reducing the total number of hours required to complete the Biology for Information

Systems major. Specific suggestions included eliminating the Calculus II requirement and the second computer programming course. Also, he thought that the statistics required for Biology could be incorporated into other courses rather than requiring a full-semester course from the Math department. He also recommended increasing the variety of upper-division courses available to biology majors and to increase the flexibility available to majors taking these courses. The students interviewed stated that, in particular, they would like additional, advanced Physiology courses.

After the reviewer's visit, the Biology for Information Systems degree program was extensively modified. The core of Biology courses was not modified very much, but Dr. Burk suggested several changes in the Biology curriculum and course offerings that might address both the recruitment and retention challenges. He noted reducing the total number of hours required to complete the Biology for Information Systems major. Specific suggestions included eliminating the Calculus II requirement and the second computer programming course. Also, he thought that the statistics required for Biology could be incorporated into other courses rather than requiring a full-semester course from the Math department.

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After the reviewer's visit, the Biology for Information Systems degree program was extensively modified. The core of Biology courses was not modified very much, but an upper level physiology course was added as recommended. The support courses were rearranged to give students a greater choice in selecting courses. In particular, Calculus II and Physics II are optional, rather than required. Alternatives to upper level computer programming courses were also added for students.

The graduates of the biology programs were commended for having well-developed backgrounds in scientific/mathematical/technical areas and were noted as being successful in gaining employment or admission to graduate or professional programs. However, the size and rigor of the curriculum might have a negative effect on the recruitment and retention of biology majors. Interviewed students expressed some interest in a greater variety of biology course offerings, more classes in the area of physiology, and more advanced courses in some sub-disciplines in Biology.

### Program Enrollment and Student Placement

Enrollment trends have remained essentially stable over the last 10 years with the exception of a decline of about 50% in Biology Education. However, in comparison with other academic institutions, DSU's Biology degree is quite low.

Dr. Burk suggested that in recruitment efforts, focus should be placed on DSU as the place to go where students can combine a strong Biology curriculum with training in

computers and information technology. Students would be provided with a “different kind of Biology,” thus giving them a competitive advantage over Biology graduates from other universities that did not provide that training.

Placement of graduates has been excellent; B.E. majors have obtained teaching jobs and B.I.S. majors have been successful in obtaining admission to graduate and professional programs or in gaining employment with major companies and government agencies.

### Faculty Credentials

Dr. Burk commented that the greatest strength of the Biology program at DSU is the well-qualified, highly-motivated, student-centered, teaching-oriented faculty. All three of the full-time faculty hold Ph.D.'s from excellent universities, and in spite of heavy teaching and service loads, they are able to maintain active research programs usually involving undergraduate researchers. All three are enthusiastic about DSU's mission and work hard to provide a technology-rich, student-focused classroom environment. Faculty-student relationships are close; students interviewed were enthusiastic about the faculty.

An area of concern was the particular teaching assignments of the faculty. One faculty member taught primarily introductory general education courses, thus the biology majors had little opportunity to benefit from her expertise or currency in the field. Another faculty member, who is an excellent teacher, taught an incredible range of courses, some only slightly connected to her training as a plant pathologist. Because of the breadth of courses that she teaches, she is rarely able to teach advanced courses in botanical areas. Since the review, Dr. Bakker is no longer teaching science education courses and is now offering upper level courses on a regular rotation. It remains difficult to offer advanced botany courses except as an overload for Dr. Hazelwood.

Also, Dr. Burk recommended that the University add a position for a faculty member with a specialization in cell biology. This person could assume primary responsibility for the existing anatomy/physiology course plus develop an advanced physiology course for Biology and Exercise Science students. This faculty member should also have extensive training in cell and molecular biology and could strengthen department offerings in this area including bioinformatics. There has been no action on this recommendation.

### Academic and Financial Support

The Biology program is well-supported by the administrative and academic infrastructure at DSU. The Biology faculty indicated good communication exists between them, the Academic Vice President, and the Dean. They also felt that the recent merger of the science programs with the arts, leading to the creation of the College of Arts and Sciences, had been successful. Relations between other parts of the college, including the Library and Computing Services, were also excellent.

Financial support of the program was a concern. According to the self-study, state support of the math and science programs had declined by 21% in the four years prior to the review, while local funds had declined by 9%. The laboratory fee of \$22.40 per student did not adequately support the science programs, and it is quite low in comparison to peer institutions where the fee is more typically \$40-\$50 per course. In the years since the review, the lab fee has been increased to \$51.40 per credit hour.

An even greater concern was the lack of staff support for the Biology program. While office administrative support was adequate, no laboratory technical support existed. Therefore, faculty must do all the ordering of supplies and equipment for the labs, must set up and take down their laboratories, as well as be present as instructors during lab exercises. They also must perform 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. This is not an efficient or well thought out use of the time of highly-trained Ph.D. teachers/scholars. If the Biology faculty did not have to spend time carrying out what are usually the functions of a technical support staff, they would have more time to spend on student recruitment, research, and grant seeking.

### Facilities and Equipment

Although the Science Center is over thirty years old, it is well maintained and provides adequate space for the Biology program's instructional needs. The center will be undergoing a total renovation project starting this summer. The renovation plans are to upgrade the existing science laboratories and provide additional teaching lab space. The lab space renovations will include exhaust fans and fume hoods as well as ventilation for lab space and offices. However, the equipment available for basic instruction is barely adequate and is certainly not what would be expected of a university of DSU's reputation. To be competitive, Biology graduates need to have experience with the basic "tools of the trade" which include additional electrophoresis equipment, gene sequencers, PCR thermocyclers, as well as the most basic equipment, such as microscopes, GPS receivers and GIS software, Spec-20 spectrophotometers, and equipment for field biology such as boats/canoes.

In addition, the faculty could pursue grant opportunities such as NSF's Instrumentation, Research at Undergraduate Institutions, and Research Experiences for Undergraduate programs as well as from private foundations such as Keck, Kresge, and the Research Corporation. The University's Development Office could also make targeted approaches to science alumni to help endow an equipment fund.

Since the review, several new pieces of equipment have been purchased, but the list of needs is still substantial. Faculty members are collaborating on a grant proposal to NSF Laboratory Curriculum Improvement program to purchase digital microscopes and other imaging technology.



### Major-Field Assessment

The Biology department requires for graduation the participation of its students in a comprehensive assessment program. While the data gathered from this is limited due to the low numbers of graduates, the department is making use of the information provided.

### Strategic Planning

The Biology department has developed strategic goals that are appropriate and achievable. The department proposes to continue successful teaching and high-quality interactions with students while increasing interaction with the K-12 schools for recruitment and government and post-graduate educational institutions for internships and job placement. Technology enhancements including the full implementation of the “wireless tablet PC” project and specific program focus on integration of technology will continue to be at the forefront. In terms of curriculum, the Biology department recognizes the need for greater flexibility and diversity in course offerings. In terms of resources, the Biology department will continue to carefully manage existing resources and will seek external funding to acquire additional resources. Dr. Burk suggests that the Biology department “go even further in terms of bolder, more ambitious initiatives.”

Dr. Burk comments that the three Biology faculty members have a good amount of overlap in areas of expertise thus allowing the opportunity for them to develop a specific focus to their department that would give it a distinct identity and focus their integration of activities with the University mission. One of the most significant and fast-growing areas of computational/technological biology is Bio-imaging. Given the training of the faculty and local connections available such as EROS, other universities, and government and private environmental agencies, this is an excellent, appropriate, realistic, and short-term strategic plan.

The biology program continues to move in the direction of increased focus on uses of digital images and technology. Faculty have purchased additional equipment and developed laboratory exercises that use digital imaging in several courses particularly those that involve microscopy. The new changes to the Biology for Information Systems curriculum include several digital imaging courses as electives.

### Overall Evaluation of Strengths and Limitations of the Academic Programs Being Reviewed

The strengths of the Biology program at DSU are in providing excellent service courses for non-majors and for students in several programs throughout the University. The program has three well-qualified, dedicated, and highly successful faculty who are excellent teacher/scholars. The program produces graduates who are well educated and

are highly competitive as applicants for graduate and professional programs or as applicants for jobs in secondary education or biotechnology. The faculty utilizes innovative teaching methods and is enthusiastic about the use of technology in their teaching.

The main limitations of the program are the small numbers of majors and the small number of faculty which results in limitations on the number and range of upper-division Biology courses. The other limitations are the lack of technical support staff and the lack of modern laboratory equipment for student training.

## **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 academic programs, as well as ways trends are likely to influence programs 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. Because these are strengths, the biology program will focus on two areas of biology which combine biology and computer technology, namely imaging technology, and to a lesser extent, mapping technology. These technologies are adaptable across many disciplines of biology and provide students with tools to be more responsive to new trends that will surface at various intervals during their working careers.

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

Moving away from the strengths of the program would raise barriers in the form of a lack of human, financial, and resources and result in a dilution of efforts beyond the scope of a small department. In contrast, connecting to and building upon the strengths

and mission of DSU provides the potential for flexibility to meet the challenges of a discipline expanding at an exponential rate.

## Academic Programs and Curriculum

### Academic degrees offered

Currently, students who are majors in biology can obtain a Bachelor of Science in Biology for Information Systems (with specializations in either Health and Applied Technology or Business) or a Bachelor of Science in Biology Education. Secondary education students with majors in other programs may elect a Biology Minor. The biology component for the Information Systems and Education majors are similar, except the Information Systems major requires 6 – 12 more credits of biology coursework, depending on the chosen specialization. The Information Systems major also includes more courses in math, chemistry and physics than the education degree program.

### Curricular Options

Students majoring in Biology for Information Systems can choose between two specializations: Business or Health and Technology. The Business specialization is designed for students seeking to enter biotechnology or agricultural businesses. The Health and Technology specialization is designed for students entering health professions or graduate programs.

### Business or Health and Technology Options      20

#### Business Specialization:

Business:		
ACCT 210	Principles of Accounting I	3
ACCT 211	Principles of Accounting II	3
BADM 370	Marketing	3
Select one of the following:		
BADM 310	Business Finance	3
BADM 350	Legal Environment of Business	3
BADM 360	Organization & Management	3
BADM 425	Production & Oper. Management	3
BADM 435	Mgmt of Technical & Innovation	3
CIS 325	Management Information Systems	3
ENGL 305	Professional Technical & Grant Writing	3
<b>Science and Math Support Courses</b>		
<b>Select 8 credits from the following:</b>		<b>8</b>

CHEM 326	Organic chemistry	4
CHEM 332	Analytical Chemistry	4
CHEM 460	Biochemistry	3
CHEM 492	Topics	4
MATH 125	Calculus II	4
MATH 201	Intro. To Applied Mathematics	3
MATH 418	Mathematical Modeling	3
PHYS 113	Introduction to Physics II	4

**Health  
and**

**Technology Option:**

<b>Health &amp; Technology:</b>		
<b>Select 20 Credits from the following*:</b>		<b>20</b>
ARTD 285	2-Dimensional Design on Comp II	3
ARTD 336	Digital Photography I	3
ARTD 382	3-Dimensional Design on Comp I	3
CHEM 326	Organic Chemistry	4
CHEM 332	Analytical Chemistry	4
CHEM 460	Biochemistry	3
CHEM 492	Topics	4
ENGL 305	Professional Technical and Grant Writing	3
ENGL 379	Technical Communication	3
EXS 350	Exercise Physiology	3
EXS 353	Kinesiology	2
HIM 130	Basic Medical Termin.	3
HLTH 320	Community Health	3
HLTH 422	Nutrition	2
MATH 125	Calculus II	4
MATH 201	Intro. To Applied Mathematics	3
MATH 418	Mathematical Modeling	3
PHYS 113	Introduction to Physics II	4

**Comparison of the program being reviewed with other regional program**

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. All of the institutions in the South Dakota Regental System except the School of Mines and Technology 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, provides a portal for posting information, submitting assignments and checking grades. In addition, simulation software (e.g., Ecobeaker), 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 computer technology each student brings with them to class, faculty, along with Risë Smith from the library, have developed a writing intensive course that emphasizes the process of science and the use of computers during that process (SCTC 303). Students are challenged to develop their skills as scientists. They must form hypotheses, design experiments, collect and analyze data (usually with computers), and draw conclusions. Strategies for searching for information and the effective oral and written presentation of the results are emphasized. Students are learning advanced skills that will make them better critical thinkers, and they are learning 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 has placed 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 the annual meeting of the South Dakota Academy of Sciences. A listing of student projects for the last 7 years can be found in Appendix A.

### **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, Zoology and Botany 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 (BIOL 151) followed by two courses that study diversity General Botany (BIOL 201) and General Zoology (BIOL 165). After completing these core courses, students are prepared to take the 300 level courses in biology: Ecology (BIOL 311), Human Anatomy and Physiology (BIOL 323), 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 and Physiology (BIOL 323). 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).

Biology education students must follow a more defined sequence of courses in the College of Education. A check sheet system has been developed to ensure that students may carefully plan their semester schedules and time of graduation. The check sheet for Biology Education can be found in Appendix B.

The College of Education has established standards that students, including biology education students, must meet to be admitted to the teacher education program. Candidates for admission must have taken a minimum of 48 credit hours and maintained at least a 2.5 cumulative grade point average. Students submit an electronic portfolio containing artifacts that support their commitment to teacher education. Before being approved for student teaching, students must meet additional requirements including submission of portfolio with teaching artifacts, a 2.7 minimum GPA in their major field, and satisfactory completion (C or better) in all education courses and field experiences.

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 165 General Zoology	4 credits
BIOL 201 General Botany	4 credits
BIOL 291 Special Problems	1-4 credits
BIOL 292 Topics	1-4 credits
BIOL 301 Plant Systematics	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 363 Ornithology	3 credits
BIOL 371 Genetics	4 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

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

The state University system changed the general education science component to 6 credits. To fulfill this requirement BIOL 101 Biology Survey I was reduced from 4 to 3 credits, and BIOL 103 Biology Survey II was added to the curriculum for 3 credits. Biology Survey II was already offered at many of the South Dakota Public Universities.

All incoming freshman students at DSU are required to take a no credit seminar GS 100 University Experience that is designed to help ease the transition from high school to college by familiarizing students with support services, facilities, and activities available at DSU. The biology faculty added a new 1 credit course BIOL 145 Introduction to Scientific Inquiry that fulfills the function of the University Experience seminar and introduces the students to the study of science.

A new upper level elective biology course BIOL 325 Physiology is added to increase offerings in advanced biology. The external reviewer of the biology program suggested that more upper level courses be offered, specifically in the areas of physiology and cellular biology. Also, many biology majors seeking admission to professional schools are required to complete two semesters of anatomy and physiology. The regular offering of an advanced physiology class would allow students to complete that requirement at Dakota State University.

A new 3 credit course SCTC 303 Computer Applications in the Natural Sciences was added to replace a pair of 2 credit courses SCTC 203 Computer Applications in the Natural Sciences and SCTC 403 Advanced Computer Applications in the Natural Sciences. Combining the content of the latter two courses into a one semester course was done to make it easier for students to complete the requirement in a timely manner.

An option for students to take major's computer science courses (using C++ programming) was removed because no students were choosing this option. The remaining computer science component was revised to include a digital imaging course (ARTD 282 Two-dimensional Design on Computers I) as an alternative to a second visual basic programming course. This change accommodates the increasing emphasis on the use of digital images in the biology program, and exit interviews with graduating seniors strongly revealed that students did not find the content of CIS 251 Business Application Programming relevant to their career goals. This course was retained in the program for students completing the Business specialization.



### Enrollment Statistics for Course Offerings

Course	2003-04	2004-05	2005-06	2006-07	2007-08
BIOL 101 Biology Survey I*	101 & 98	98 & 95	122 & 96	107 & 95	110 & 87
BIOL 103 Biology Survey II*	-	-	16 & 40	33 & 71	58 & 65
BIOL 145 Intro to Scientific Inquiry	-	-	8	12	8
BIOL 151 General Biology I*	49	64	53	69	59
BIOL 165 General Zoology*	87	81	27	32	35
BIOL 201 General Botany*	44	35	21	-	16
BIOL 311 Principles of Ecology	13	-	17	-	16
BIOL 323 Human Anatomy & Physiology	54	45	45	46	53
BIOL 325 Physiology	-	-	-	19	15
BIOL 331 Microbiology	-	14	-	17	-
BIOL 343 Cell & Molecular Biology	-	15	-	12	-
BIOL 371 Genetics	14	-	20	-	11
BIOL 450 Aquatic Biology	-	6	-	10	-
BIOL 492 Adv. Spec. Top.**	8 & 18	6 & 8	10 & 9	7 & 18	8 & 15
BIOL 498 Capstone	3 & 1	1 & 1	1 & 2	2 & 4	1 & 5

\* Courses that may be taken in fulfillment of general education requirements.

\*\* Advanced special topics courses are taught on diverse subjects to give the students exposure to information and skills not taught in the traditional curriculum. In addition, to 3 and 4 credit courses, most semesters a one credit discussion class is offered exploring recent discoveries or interactions between science and society.

#### Special Topics Course and Seminar Offerings:

- Fall 2003 -Controversies in Teaching Evolution
- Spring 2004 - Biological Diversity
- Fall 2004 -Histology
- Spring 2005 -Fast Forward: Science Technology & the Communications Revolution
- Medical Physiology
- Fall 2005 -Ecology and the Collapse of Human Societies
- Advanced Botany
- Spring 2006 -Conservation of Animal Populations
- Fall 2006 -Cells and Tissues
- Spring 2007 -Vertebrate Biology
- Ethics in Biology
- Fall 2007 - Ethnobotany
- Spring 2008 - Dinosaurs
- Primate Ecology and Evolution

#### **Relationships with Other Programs at Dakota State University**

Many of the courses in the biology program are required for students in other majors. Students in Respiratory Care, Health Information Management and Exercise

Science take BIOL 151 General Biology and BIOL 323 Human Anatomy and Physiology. 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 323 Human Anatomy and Physiology and BIOL 325 Physiology. The list of elective support courses includes BIOL 331 Microbiology, BIOL 343 Cell and Molecular Biology, and BIOL 371 Genetics.

Biology courses are also included as electives within the science components of several majors. Students majoring in Mathematics for Information Systems may take BIOL 311 Ecology or BIOL 371 Genetics. Students in Physical Science and Physical Science for Education may take BIOL 311 Ecology, BIOL 371 Genetics, BIOL 343 Cell and Molecular Biology, or BIOL 331 Microbiology.

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

### **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.

## Program Enrollments and Student Placement

### NUMBER OF DECLARED MAJORS FOR THE LAST 5 YEARS

Major	2004/05	2005/06	2006/07	2007/08	2008/09
<b>Biology for Information Systems</b>	7	10	15	15	17
<b>Biology Education</b>	2	4	5	5	4

### NUMBER OF DEGREES GRANTED FOR THE LAST 5 YEARS

Program	2004/05	2005/06	2006/07	2007/08	2008/09
<b>Biology for Information Systems</b>	2	3	3	4	5
<b>Biology Teacher Education</b>	1	0	1	1	1

### Employment potential and placement

Nearly 100% of students from both Biology Education and 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 the positions and geographic locations of student placement since the last biology program review.

Year	Placement	Major
2004	Yellowstone National Park, Wyoming	Biology for Information Systems
	Sioux River Ethanol, Hudson, SD	Biology for Information Systems
2005	SDSU, Brookings (Lab Tech)	Biology for Information Systems
2006	None accepted placement immediately after graduation, most went on to grad school	Biology for Information Systems
2007	MINCEP Eloses Care, St Louis Park, MN	Biology for Information Systems
	USDA Forest Services, Rapid City, SD	Biology for Information Systems
	West-Con, Milbank	Biology for Information Systems
2008	Southeastern Behavioral, Sioux Falls	Biology for Information Systems
2004	Goshen School District, Torrington, WY	Biology Education
2004	Deubrook Schools, Deubrook, SD	Biology Education
2005	No Biology Education Grads	
2006	Morris Public Schools, Morris, MN	Biology Education
2007	Lincoln High School, Ivanhoe, MN	Biology Education
2008	Kimball High School, Kimball SD	Biology Education

2008	Patrick Henry Middle School, Sioux Falls, SD	Biology Education
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## Faculty Credentials

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

Kristel Bakker, Assistant Professor of Biology, Ph.D., South Dakota State University  
 Dale Droge, Professor of Biology and Academic Coordinator, Ph.D., Univ. of Illinois  
 Donna Hazelwood, Associate Professor of Biology, Ph.D., Cornell University  
 Nevine Nawar, Adjunct Instructor of Biology, Ph.D., Univ. of Alexandria, Egypt

A vita for each faculty member is contained in Appendix C.

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  
 Richard Bleil, Ph.D., Professor of Chemistry  
 Tom Brandenburger, M.S., Instructor of Physics  
 Jeffrey Palmer, Ph.D., Professor of Mathematics  
 Barbara Szczerbinska, Ph.D., Assistant Professor of Physics  
 Andrew Shiers, J.D., Instructor of Mathematics

## Anticipated Changes in Staffing

Since the last review, the College of Education hired a science education specialist. This change allowed Dr. Bakker to return to teaching biology courses full time. The required addition of BIOL 103 to the general education curriculum created a need for additional staff. Dr. Nevine Nawar is currently teaching the lecture and laboratories for that course as a part-time adjunct faculty member.

## Faculty or Student Research

Dr. Kristel Bakker grew up in South Dakota which gave her a deep appreciation for the prairie and a passion to further existing research on how to preserve and restore grassland habitats. 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. Dr. Bakker's research interests encompass all areas of prairie ecology, but most specifically, the conservation and management of grassland birds (waterfowl, upland game and nongame species). Her research projects incorporate landscape level habitat variables because

insights into how birds perceive grassland habitats at various landscape scales will enhance our ability to direct grassland conservation over broad geographic regions.

She strongly believes in conducting applied research. 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 recommendations is critical to the conservation and management of species. To this end, Kristel has consulted with state and federal government and private agencies on how to best manage habitats for nongame birds and has received funding for a research project studying grassland birds from the South Dakota Department of Game, Fish, and Parks and Competitive State Wildlife Grants. Current and past projects include nesting studies on nongame birds, waterbirds, ring-necked pheasants and waterfowl in eastern South Dakota, and habitat and distribution studies of nongame birds and the burrowing owl in western South Dakota. She also collaborates with Kent C. Jensen and Charles Dieter from South Dakota State University.

Dr. Dale Droge is researching water quality problems in the watershed around Madison. Most of the effort has involved determining loadings of phosphorus coming into the lakes through tributaries and storm runoff. With ecology students, he has been monitoring the invasion of buckthorn into woodlots in eastern South Dakota. He has 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.

Dr. Donna Hazelwood's research interests are plant microbe interactions involving native and introduced plant species and effects of plants on growth of microorganisms. She is also interested in epidemiology of plant pathogens, specifically *Ustilago maidis*, and plant viruses, insect plant relationships. She also does research on plant polarity and has recently begun research on the detection and incidence of *E. coli* and waterborne coliforms. Finally, she carries out research on SoTL.

Research activities include capstone research projects, DSU CEX SRI grants, and ASM UTF grant activities with DSU undergraduate students. Seven projects have involved plant-microbe interactions, one on plant polarity, one on insect-plant interactions, and five on epidemiology of *Ustilago maidis*, and various other topics; most have resulted in paper- or poster presentations. In addition she has presented over 15 papers on SoTL.

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

### **Service to Community**

Dr. Kristel Bakker has served on several DSU committees including: Assessment, Secondary Education Coordinating, Professional Education Coordinating, Human Subjects, Faculty Research, Animal Care and Use, Biology and Physics faculty search

and screen committees, and grade appeal committees. 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 workshop every year since 1997 and leads educational activities at local state parks.

Dr. Droge is a member of the campus-wide faculty development committee and is the academic coordinator for math and science programs within the College of Arts and Sciences. He is one of Dakota State University's representatives to the Science Discipline Council that includes all of the public universities in South Dakota. 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 serves as the city of Madison representative on the Lake Area Watershed Improvement Committee and carries out an active water monitoring program in cooperation with this group. He conducts a number of nature and other science programs for the Madison School district and Lake Herman State Park.

Dr. Hazelwood provides service to the College of Arts and Sciences by advising undergraduate research, and for DSU CEX, SRI, and ASM UTF grants. She is active on five DSU committees, including the writing intensive task force, and the Model United Nations. In addition, she supports student activities financially and supervises student activities including field trips to the Nobel Conference, the Wentworth Ethanol Plant and Hematech.

Dr. Hazelwood participates in academic/campus committees, program/university assessment, and accreditation on an as needed basis. She regularly participates in student recruitment/ retention activities and meets with prospective students and parents throughout the year including breaks and summer. She is involved in activities which support the university's strategic initiatives such as the Wireless Mobile Computing Initiative and Desire2Learn. She has been invited by Jesse Wise, DSU Vice-President of Students, to participate in the new initiative on Character and Technology, and the Hallmarks of Excellence Project.

Dr. Hazelwood facilitates faculty/staff development activities through the Faculty Development Committee. She has served as faculty representative to larger university community through activities on the Collaboration Board of Directors and the on the Teaching and Education Committees of the BSA, and the South Dakota Academy of science.

Donna participates in professional organizations at the local, state, regional and national level. She is active in the Interlakes Water Quality Committee, and runs the DSU mini lab for detection of E. coli and waterborne coliform bacteria. She is on the Executive Council as Secretary for the South Dakota Academy of Science and is an Associate Editor for Botany. Dr. Hazelwood serves on the Board of Directors for the Collaboration for the advancement of college teaching and learning. She is active in the Botanical Society of America, serving as secretary of the Teaching Section, a member of the Education Committee, and as a Super Mentor for the national BSA Planting Science project. In addition, she serves as a reviewer for text book chapters.

Dr. Hazelwood shares her professional expertise with the community or public by facilitating the annual video discussion series at the Madison Public Library, and as an AAUW judge for the Madison Daily Leader Spelling Bee. She has also judged middle- and high school science fairs, and presented talks for the Red Cross Garden Walk and Talk. Donna is also a member of the Journey Women collaborative art project.

### **Description of Student Organizations**

Many biology students belong to the Math and Science club. This organization provides educational opportunities to students and carries out projects which serve the university and community. The club promotes science education through activities highlighting pi and mole days. In the spring, the members present a chemistry magic show for area elementary students. A major outreach activity is the offering of a math and science contest for high school students each year. Most fall semesters the club assists Dr. Hazelwood with a trip to the Nobel lectures at Gustaveus Adolphus University in St. Peter, MN. About every other year, the club members travel to museums and other events in the region.

In 2007, Dr. Barbara Szczerbinska led a campus effort to establish an organization that would promote careers in science to women. Women in Science and Technology (WIST) brings speakers to campus, takes trips, and supports women majoring in the sciences and computer fields. A grant also provided the awarding of scholarships to female students in these areas. This organization recently received the Board of Regents Award for Academic Excellence on the Dakota State campus.

### **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**

The Karl E. Mundt Library on the campus of Dakota State University 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 biology.

The mission of the Karl E. Mundt Library is to supply the library and 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 150,000 items, ranging from books to microfilms to interactive CD-ROMs, and supports all subjects the University offers.

The Karl E. Mundt Library boasts tremendous access to the resources needed by anyone pursuing a fitness or exercise science related research topic. Even though the library does not have an extensive list of books related to exercise science, they are readily obtainable through interlibrary loan. The Library has holdings of several major periodicals that are useful to biology students including *Nature*, *Science*, *American Biology Teacher*, *Scientific American*, and *American Scientist*. The library also has subscriptions to more than 35 full text online publications in the biological sciences. The Library tracks periodical usage and subscribes to titles most in demand.

These and additional resources are available through a variety of means: the South Dakota Library Network (SDLN), Internet, UMI ProQuest Full Text, and the various indexes accessed by the Mundt Library. In short, there is little the Library cannot acquire to fill student or faculty needs. The Library also maintains a Homepage on the World Wide Web ([www.dsu.edu/departments/library/index.html](http://www.dsu.edu/departments/library/index.html)) that can be accessed at any time and includes updated information and logical links to search engines

### **Computer Infrastructure**

Within the unit of Computing Services, the Network Services group is responsible for planning, implementing, and securing network services for campus computing resources. A variety of servers in the Server Room 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 Zolnowsky, Director Computing Services  
 Craig Miller, Senior Systems Programmer, Computing Services  
 Brent Van Aartsen, Communication Network Specialist, E – Education Services

## Financial Support

There are two sources of funds that support the biology program. State funds 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 Biology, Mathematics, Physical Science and Respiratory Care.

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.

In addition to the resources available through state funds allocation, a lab fee of \$51.40 is assessed for each student taking a laboratory course. The lab fees are placed in a local account and support courses in Biology and Physical Science. 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.

## Budget for Math and Science Programs 2000 - 2004

Fiscal Year	State Funds	Local Funds	Total
2005	\$27,525	\$17,859	\$45,384
2006	\$27,006	\$23,145	\$50,151
2007	\$64,429	\$30,000	\$95,429
2008	\$65,106	\$30,700	\$95,806

The increase in local funds reflects the carryover of unspent annual allocations and the increase in the lab fees charged to students. Many major purchases have been postponed to increase funds that may be needed to help equip the renovated labs (see below). About \$25,000 is already committed to the purchase of digital microscopes, new computer interfaces and probes for the biology labs, and computer instrumentation for the physics labs.

## 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 supplies and low-cost equipment. In addition, more extramural support will be sought in the future (e.g. CCLI grant from the National Science Foundation).

## **Facilities and Equipment**

### **Current Facilities**

The Science Center at Dakota State contains three classrooms each with a capacity of 50 people, a 200 seat auditorium, two chemistry laboratories, one physics lab room, a general purpose lecture/lab room, and three biology laboratories. One of the biology labs is set up primarily for microbiology and other advanced courses. It has a capacity of about 25 students. The other two rooms are general purpose where mostly introductory courses are taught (capacities of 32 and 48 students). A 300 square foot greenhouse is attached to one of the general purpose labs. There are two prep rooms for biology, one of which is also used for research and field equipment storage space.

In 2007, money was allocated for a complete renovation of the DSU Science Center. Plans are currently being finalized and construction is scheduled to begin in the late summer of 2009. The building is scheduled to be ready for classes at the beginning of the fall semester 2010. The building will not increase in size, but every room will be remodeled and updated. The current plans have the faculty offices moving to the outside of the building and classrooms added to the central area. The biology teaching labs will have new cabinets and workspaces. One prep area will be expanded by 100 square feet and be reconfigured as a research space for water testing and other environmental activities. The other major prep area will be expanded by the removal of a obsolete growth chamber and reworked as a projects area for undergraduate research.

### **Quality of the Facilities**

After the remodeling project is finished, the facilities will be excellent.

### **Additional Facilities Needed**

No additional facilities are needed at this time.

### **Capital Equipment**

Computer equipment for classroom and lab:

Computer interfaces, software, and data probes (Pasco)

Sharp Projectors mounted in two of the biology laboratories

Video camera mounted on binocular microscope

5 digital cameras with microscope adapters

Available for Faculty Use:

Networked laser printer/copier, computer with multimedia software, flatbed scanner, slide scanner, and a color inkjet printer located in the Science Center office

### **Biology Laboratory Equipment**

See list in Appendix D.

### **Quality of Current Equipment**

Some of the current equipment is in good condition and works well. However, much of the major equipment is out dated and will be replaced during the remodeling of the building. The purchase of a new autoclave in 2008 remedied one of our most urgent needs for new equipment.

### **Additional Equipment Needed**

It would be impossible to obtain all the equipment that could be used, but some equipment needs to be purchased to further the computer-integration mission of the university. Included in this list would be compound and dissecting microscopes with camera adapters, digital video camera that can be attached to a microscope, Global Positioning System receivers and GIS software for mapping

Other equipment needed for laboratory courses are electrophoresis equipment and power supplies, pH meters and a boat and/or canoe for aquatic research.

## **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.
- c. Graduates have solid social skills.

**Goals specific to the degree in Biology for Information Systems:**

- Graduates of the Biology for Information Systems program will be able to gain employment in business and industry where an understanding of the world of business, information systems, biology, and related math and science areas is required or desirable.

**Goals specific to the degree in Biology for Education:**

- Graduates will be effective teachers of the biological sciences at the secondary level.
- Graduates will be prepared to integrate the use of computers into teaching processes within the biological sciences.

**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. In 2008, a faculty member was appointed to coordinate assessment activity for each degree program at DSU. Dr. Droge is the coordinator for Biology for Information Systems and Biology Education. 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**

<b>Major</b>	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
Biology Education	4-year	X	X	X	X	X	X	X

### **Major Field Assessment Plans**

The assessment activities for each major within the college are summarized on a form that lists the goals, outcomes, and expected standard of performance (complete plan and report in Appendix E). Assessment data are collected and used to determine whether the performance standard was achieved.

Beginning in 2005, the South Dakota Board of Education adapted administrative rules to require content and pedagogy tests for teacher certification to meet the No Child Left Behind requirements for highly qualified teachers. Biology for secondary education graduates take the Praxis II exam in the semester before student teaching and this is used to assess content learning in biology. Biology for Information Systems majors complete the Major Field Assessment Exam (MFAT) produced by ATC to assess content knowledge.

For the period since the last program review, the overall pattern is that students met the desired standards of performance within the program. Graduate and employer surveys, and exit interviews with graduating students indicate a high degree of satisfaction with the program. The 2008 program assessment report with data from 2005-2007 can be found in Appendix E.

## **Strategic Planning**

### **Strategic Plan of Dakota State University 2007-2012**

#### **Introduction**

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.

### **Vision (2012)**

DSU has a broad national reputation for providing a dynamic, information technology rich learning and research environment.

### **Values and Commitments**

Dakota State University's 2007-2012 strategic plan reflects the following set of values and shared commitments to:

1. An uncompromising passion for DSU's information technology mission.
2. The use of data-informed decision making to improve and enrich the university's programs.
3. Academic research that produces adapts and incorporates new discipline- and pedagogy-based knowledge.
4. An unwavering support for student success and learning by promoting active engagement and creative problem-solving.
5. A relentless pursuit of emerging technologies.
6. Effective communication that is open and honest.
7. A university experience that promotes an understanding of our diverse world.
8. Cutting-edge academic programs focused on its information-technology mission.

### **Where We Are Now**

Dakota State University provides students with an open, friendly, safe, challenging, and collaborative environment. The university encourages all students to participate in activities that enrich their academic experience, such as participation in extra-curricular activities, research, and outreach. Its faculty and staff are high-quality, caring, and student-focused. In 1881 the university began as the teacher education institution for the entire Dakota Territory. It continues to fulfill that mission and at the same time integrate the use of information technology in the education of teachers. Dakota State University is proud to be recognized by both the National Security Agency (NSA) and the Department of Homeland Security as a National Center of Excellence in Information Assurance Education. In December 2005, the South Dakota Board of Regents authorized DSU to offer its first doctoral degree.

The institution is proud of its graduates, the high job placement levels that they achieve, and their frequent choices to remain in the state to build South Dakota's economic base and quality of life.

The University has concluded the successful implementation of its 2002 – 2007 strategic plan. Details regarding active and planned initiatives that grew and resulted from the 2002 -2007 Strategic Plan are available on our campus web site at—  
[http://www.departments.dsu.edu/presidentoffice/Documents/stategic\\_plan.htm](http://www.departments.dsu.edu/presidentoffice/Documents/stategic_plan.htm).

## **Focus**

Through a strategic planning process, DSU has developed seven overarching goals for the University. The goals are stated in brief here and discussed more fully in later sections.

1. Expand current information technology leadership through cutting-edge programs.
2. Optimize on-campus student enrollment and enhance program quality by attracting high-ability students.
3. Increase student retention and graduation by providing an exceptional student experience.
4. Advance DSU's emphasis on applied research.
5. Extend DSU's educational outreach through online and alternative-location delivery.
6. Promote increased visibility and recognition of the University.
7. Develop new sources of revenue.

## **Strategic Goals of the College of Arts and Sciences**

The College of Arts and Sciences has produced a plan that encompasses the DSU strategic initiatives, but focuses on how the goals and objectives will be addressed at the college level. <http://www.dsu.edu/documents/assessment/institutional-effectiveness/sp-iec-table-2008.pdf>

## **Strategic Goals of the Biology Program**

The goals of the Biology Program are consistent with the strategic initiatives at the University and College levels.

### **Recruitment and Retention:**

- Biology faculty will continue to develop high-quality interactions with students in the program and provide consistent and accurate advice.
- The program will increase interactions with external groups such as K-12 schools, and agencies such as U.S. Fish and Wildlife Service and the South Dakota

Department of Game and Parks to recruit potential students and provide more internships and other experiences for current students.

- Increase efforts to inform students about careers in the health professions and help with the application process.

### **Technology**

- Wireless mobile technology (PC tablets) will be integrated into general education courses and along with other computer technology will be used in all biology courses as soon as possible.
- The use of digital images will be increased in all courses with students developing their own study guides and lab manuals in many courses.
- More equipment will be obtained that can be connected to the new technology and allow the collection of extensive and long term data.

### **Academic Programs**

- The biology faculty will carefully revise the current curriculum to achieve the flexibility needed to accommodate the diverse career goals of our students. With an increasing number of students interested in health professions, wildlife and resource management, and research lab technology as well as education, additional options are needed.
- Other changes in the curriculum are necessary to allow an increase in the number and frequency of upper level biology offerings. Currently, students are generally pressed to take enough elective biology credits to meet the requirements, and a greater diversity of special topics offering would be desirable.
- The biology program and exercise science program need more interaction to improve the scheduling of courses. Majors take courses in both programs and conflicts are too frequent. Faculty should work together to provide course offerings that would be beneficial to students in both programs. A positive step in this direction was the addition of an upper level course in physiology.

### **Management**

- Faculty from biology and physical science need to carefully plan how the existing lab account funds can be better used to purchase equipment for the teaching laboratories. The needs should be listed and a plan established to prioritize purchases.

### **External Funding**

- Biology faculty will seek grant funding to increase the research capacity of the program and further the use of technology in the classroom and laboratory.