

Academic Program Review, Bachelor's of Science in Biology

College of Arts and Sciences

Dakota State University

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Part 1. Executive Summary of Findings

The Biology Program at Dakota State University (DSU) has five enthusiastic faculty members (three tenure-track, one full-time instructor, and one instructor/laboratory manager) who are dedicated to providing students with challenging and rewarding experiences both inside and outside the classroom. The program has four well-defined goals as a part of its assessment plan. The current assessment plan primarily evaluates students upon graduation, but steps are being made to make assessment an integral part of the curriculum so as to identify areas where students might start to lag behind much earlier in their degree progress. The Biology Program is housed along with faculty from mathematics, chemistry, and physics, who teach many of the required supporting courses to biology majors, in the recently (2010) renovated C. Ruth Habeger Science Center. The resources available in the Science Center are adequate to meet the current needs of the program; if there were to be even small increases in student enrollment, however, the lack of dedicated research space will become a real detriment to both students and faculty. A lack of dependable funding for both new equipment purchases and maintenance of high-end equipment is a real concern. State funding is essentially stagnant, and student fees are not a sustainable means by which to acquire new equipment. Faculty are encouraged to write grants for major equipment purchases, but without institutional support both in release time to produce the grants and funds to maintain the equipment these efforts will not be successful.

The program offers several classes that meet general education requirements and prerequisites for admission to health care professions. These courses have relatively high enrollment and can be offered annually. Courses unique to the biology major, however, have chronically low enrollment and are offered every other year. This affects the sequence in which students take courses and, as a result, almost all courses in the major have only BIOL 151 General Biology I as their prerequisite, impacting the ability of faculty to build on students' previous knowledge. Retention of biology majors between the first and second year is quite good at 85%, but over the most recent 7-year period for which data are available, only 21% of students graduate within 6 years (institutional graduation rate over the same period is 41%). Efforts should be directed toward understanding why so few students complete the program so as to have both larger numbers of students in the upper division courses and higher graduation rates. The program name was changed from Biology for Information Systems to Biology for the 2017-18 academic year, and next fall the degree program will be reorganized into two distinct emphasis areas, molecular biology and integrative biology. It is hoped both the name change and the emphasis areas will attract more students to the program.

All students in the program complete BIOL 498 Undergraduate Research/Scholarship. This is an invaluable experience for the students, but this experience comes at a cost to the faculty in terms of both dedicated one-on-one time with students and resources (consumable supplies). As students also have other courses that can involve significant one-on-one time with faculty (BIOL 491 Independent Study, BIOL 492 Topics), there is a reasonable limit to the number of these experiences the three tenure-track faculty can provide. Faculty are already stretched to their limits with multiple course preparations and research requirements. Even a small increase in biology majors (less than 10 students) that would fill enrollment in existing upper division courses would tax the faculty even more in terms of quality research/scholarship experiences for the students. It is important to note that the faculty and students are carrying out excellent research with so few resources and no dedicated space for research. All tenure-track faculty have published since 2015 and students have presented their results at professional meetings despite difficulties in obtaining funding to attend such meetings. The institution must develop a dependable means to support faculty and students in these endeavors. They can be DSU's greatest asset in attracting bright, ambitious students to the institution, but they need more institutional support in order to do so.

Part 2. Schedule of On-Site Visit February 9, 2018

9:00 am	Dr. Scott McKay, Provost and Academic Vice President Presidents Conference Room
9:30 am	Dr. Ben Jones, Dean of Arts and Sciences Presidents Conference Room
10:00 am	Dr. Jay Kahl, Director of Assessment Presidents Conference Room
10:30 am	Tour and conversation with Biology Faculty Dr. Dale Droge, Math & Science Coordinator
12:00 pm	Lunch with Biology Faculty Marketplace
1:00 pm	Conversations with Biology Students Science Center 133
1:45 pm	Conversations with Biology Faculty Science Center 133
3:00 pm	Open time to prepare for exit interview Science Center 133
4:00 pm	Exit interview with Dr. McKay, Dr. Jones, and Dr. Droge Science Center 133

Part 3. Program Evaluation

A. Program goals and strategic planning

The program has four clearly-stated goals as part of their assessment plan:

1. Graduates will have a basic knowledge of the principles of biology.
2. Students will be able to use their knowledge of concepts in biology to solve new problems.
3. Students will have a high degree of proficiency in the use of computer technology.
4. Students will be able to communicate their knowledge and results effectively for a wide range of purposes and intended audiences.

The new degree program with two distinct areas of emphasis that will begin fall 2018 both include a common core of courses that cover a wide range of biological topics, ensuring that graduates of each emphasis area will be broadly trained. Goals 1, 2, and 4 are consistent with the discipline and goal 3 is consistent with both the discipline and the mission of DSU.

Trends within the discipline are extremely difficult to identify because biology encompasses such an incredible variety of sub-disciplines ranging from molecules to mammoths to healthcare to ecosystems. Students who are well-versed in not only biology but also in chemistry, mathematics, and physics and students who have both critical-thinking skills and excellent communication skills will have the talents and flexibility to meet the challenges of tomorrow. The Biology Program at DSU

strives to ensure that all of its students will develop the skills necessary to be successful scientists who contribute to the discipline upon graduation.

One recommendation from the last program review (2009) was to redesign the non-majors survey courses (BIOL 101 Biology Survey I and BIOL 103 Biology Survey II) so that contemporary issues in biology are a major theme. In the materials provided it states that this has been “favorably discussed by the biology faculty but has not been implemented to date.” Including online sections, approximately 210 students enroll in BIOL 101 and 125 students enroll in BIOL 103 annually. The program is encouraged to pursue this course redesign because educating students to be well-informed citizens is one goal of the general education program. Redesigning a two-semester course sequence with laboratories, however, is a major undertaking, and the faculty are already working at capacity. In order to accomplish a significant course redesign, the faculty need meaningful release time from some of their other duties, which simply isn’t feasible at current staffing levels. The institution should make this a priority as it falls in line with the revision of the entire general education assessment processes across all campuses.

B. Program resources

The C. Ruth Habeger Science Center is a modern facility with a comfortable auditorium for larger lecture classes (including other courses in the college), five teaching laboratories (one of which is shared by biology and chemistry research), a dedicated preparation room, an attached greenhouse, two conference rooms, and faculty offices. Smaller lecture classes may meet in the laboratories so as to facilitate blending of lecture and lab. The program maximizes the use of these rooms as different courses utilize the same laboratory space and many are used for student research during open class periods. The Science Center also houses chemistry, physics, and mathematics, facilitating collaboration between disciplines. What is absent is any space dedicated to research for both the faculty and the students. If DSU expects students to participate in independent research, then it needs to provide them with the resources to do so and that includes physical space. Students need a place where they can keep the resources unique to their project so that they do not have to repeatedly set up and then tear down their equipment. Quality research cannot be done between classes when the laboratory spaces are open. The fact that faculty and students have completed high-quality research projects in the absence of dedicated physical facilities is a testament to their skill and creativity.

The faculty currently consists of three full-time tenure-track professors, one full-time instructor, and a laboratory coordinator who also teaches laboratory sections for the general education courses. The faculty are highly trained and all hold advanced degrees in the discipline. In addition, the tenure-track faculty have published as recently as 2015. The tenure-track faculty are tasked with teaching not only all courses within the core but also all courses within each emphasis area. The previous reviewer (2009) recognized “positive aspects of faculty teaching outside of their specialization because they could develop cross-disciplinary connections.” While I do not disagree with this on a conceptual basis, in practice the program should be cautioned against stretching faculty too far outside of their area of expertise. Faculty are life-long learners but there is no substitute for someone whose training is specific to a particular field or sub-discipline. Exposing students to additional areas of biology has to be tempered with the realization that the faculty cannot be experts in everything. Again, the faculty are already stretched to capacity.

Dr. McKay indicated that his goal was to increase overall enrollment at DSU by more than 50% to 5,000 students. He also indicated that the Biology Program could absorb more majors at first by simply filling in openings in existing courses. For example, additional sections of BIOL 371 Genetics need not be offered until the existing course is full with 24 students every other year. This would be an increase of approximately 7 students in the major. Considering only the courses in the Biology

core, approximately the same number of additional students would make full sections of BIOL 311 Ecology and BIOL 331 Microbiology. A hidden cost to this is the increase in grading workload for faculty teaching these courses. While making sure that courses are at capacity for these kinds of courses before offering additional sections or increasing staffing seems logical, this logic does not hold up when considering that all students must complete BIOL 498 Capstone. An additional 7 students would mean each tenure-track faculty member would have to advise at least 2 additional research students. My program required all students to conduct independent research when I was hired in 1993 and recently (2016) restructured the major to remove this requirement. While we still feel that independent research is an extremely valuable learning experience for students, the individual attention and expense required for every student in the major was simply not sustainable. Between 1994 and 2015, I mentored 117 student projects, which averages out to 5-6 students per year. Since 2000, however, I never mentored more than 4 students at a time because otherwise I simply could not provide all students with a positive experience. Unlike faculty at DSU, I often had only a 9-hour teaching load (3 hours release time for research) and following a building renovation I had dedicated space for research. The majority of these student projects were far from cutting-edge research and most were not presented off campus; rather, they were intended to provide the students with a chance to design a project and carry it through to completion. If DSU expects Biology faculty to engage all students in significant research, then a significant investment must be made in both facilities, funding, and staffing. It was mentioned that perhaps students with an interest in a career in the health care field might pursue their independent research with faculty in the Exercise Science Program. This is not a solution to overstretched faculty in the Biology Program as the faculty in the Exercise Science Program have their own students to mentor.

The self-study indicates that current equipment meets the program's needs but maintenance is an ongoing problem. Service contracts are a routine part of large equipment purchases and DSU has to dedicate funds to support the maintenance of this equipment. Classroom microscopes, for example, should have routine servicing and a line item should be in place to cover those costs. Service contracts on delicate instruments such as the gas chromatography – mass spectrophotometry (GCMS) must also be funded, particularly if the goal is to have these kinds of pieces of equipment be used by students in the classroom setting as well as for research. When speaking to the students one mentioned measuring nearly 100 samples by hand because the program did not have a 96-well plate reader. I mentioned this in the exit interview and this was met with some chuckles about student labor being inexpensive, but the point I was trying to make was that the student is not learning to analyze the samples the way it is currently done in most any laboratory. Relatively speaking, a plate reader is not very expensive (\$5,000 - \$6,000) and is considered a basic piece of laboratory equipment. Faculty can apply for grants to purchase larger items such as a high-pressure liquid chromatography (HPLC) unit or a fluorescence microscope, but without institutional support for maintenance contracts the grants are unlikely to be funded.

The two funding sources for the program are those allocated to the College of Arts and Sciences which are shared by all programs in the Science Center and those available through a discipline fee of \$20 per credit hour for science courses. At the time of this review it was proposed that this fee be increased to \$40 per credit hour, which would increase the funds available in this account from approximately \$35,000 to \$70,000 per year (assuming no increases in student enrollment). Unspent funds are placed into a reserve account which can be carried over indefinitely, allowing the reserve account to build in order to make major equipment purchases. Increasing expectations, however, have required significant spending from the reserve account and, if that rate of spending continues, the account will be exhausted in 2020. The Biology Program has requested an increase in the annual lab budget of \$27,000 to support student research. While it is reasonable to ask students to pay lab fees for consumables they use in the lab, it seems unreasonable to burden students, particularly non-majors, with additional fees to go into a reserve fund for perhaps years in order to eventually pay for major

equipment purchases. The students need to benefit directly from the fees they pay. Furthermore, a line item in the proposed increase in the annual lab budget to support student research was \$15,000 for summer student stipends. These stipends should definitely not come from the increased lab fees. It is completely unreasonable for one student to pay fees that will eventually go to another student in the form of a stipend. If DSU is truly dedicated to involving students in the research process and that research is to include summer experiences in which the students receive stipends, the university will have to develop a different means of supporting that goal. Increasing student fees is not an appropriate funding source in this case.

The push to increase student involvement in research needs to be matched by a similar push to make sure faculty can stay current. Faculty can apply for support for professional development and training of up to \$1000 annually. Even regional professional conferences can exceed \$1000 in costs considering the distances that faculty may have to travel. Attending a national or international conference is likely out of the question without additional support. In addition, institutional support for students attending regional and national conferences needs to be improved. It is unreasonable to expect students to pay all costs up front and then wait to be reimbursed. Students do not necessarily have credit cards on which to put these charges nor the necessary balance on a debit card to absorb these charges. If DSU truly wants students to attend professional conferences, a mechanism to pay the majority of the costs for registration, travel, and lodging needs to be in place so as to make the experience a positive experience for the student, not one in which the student is saddled with credit card debt and interest payments.

C. Program curriculum

The program will be offering two areas of emphasis within the Biology B.S. degree starting fall 2018: Molecular Biology Emphasis and Integrative Biology Emphasis. Each consists of the same 29 credit hours of Biology “core” classes plus an emphasis area of 16-22 hours. The core includes a year-long sequence in general biology plus coursework in ecology, microbiology and genetics. BIOL 221 Human Anatomy seems somewhat out of place in the core, however, due to its specific focus on humans. This course has a healthy annual enrollment due to its attraction to students pursuing careers in health care so students will dependably be able to enroll, but it does look out of place when all the other core courses have a broader biological application.

Both emphasis areas include 5-11 hours of BIOL 492 Topics and BIOL electives. When examining the list of courses currently offered, however, the only courses from which to choose are either courses specific to the other emphasis area, BIOL 491 Independent Study, and SCTC 303 Introduction to Biological Instrumentation. SCTC 303 is offered every other year and has a healthy enrollment. The catalog description for BIOL 491 and BIOL 492 both include language about the enrollment typically less than 10 students with “significant one-on-one student/teacher involvement.” The catalog description of BIOL 498 Capstone also includes language about “extensive and intensive” contact between the student and faculty mentor. While these kinds of experiences are extremely valuable for the student, the faculty are not going to be able to maintain that kind of schedule, particularly if the number of students majoring in biology increases by only 10 students. The degree plan suggests that students will enroll in at least two if not three of these kinds of low enrollment, intensive individual contact with faculty classes in order to complete their degree. Faculty are already taxed with multiple course preparations, one or two of which might be stretching beyond their area expertise. While these kinds of independent study courses are a hallmark of the student experience at DSU, the expectation for faculty to provide multiple highly individualized experiences will be completely unfeasible without an increase in staffing if student enrollment increases.

One concern is the fact that the majority of courses have as their only prerequisite BIOL 151 General Biology I. In fact, the only courses in the major with a prerequisite other than BIOL 151 are BIOL 325 Physiology, with a prerequisite of either BIOL 221 Human Anatomy or BIOL 323 Human Anatomy and Physiology, and BIOL 450 Aquatic Biology, which requires students to have taken BIOL 311 Principles of Ecology in addition to BIOL 151. No prerequisite at all is listed for BIOL 422 Immunology. Students expressed some frustration that the same topics were repeated in multiple courses (the “reinforcement” part of the assessment plan). When I mentioned this at the exit interview, it was met with laughter from all in attendance so I did not pursue the issue. Of course, topics will be repeated and no one expects students to master a concept with one exposure, but what the students noticed was that the topics were repeated either from the same starting point and/or at the same level of expectation. If all courses have as their only prerequisite BIOL 151, instructors cannot assume that all students in the class, even a 400-level class, have expertise beyond that very basic level. The sciences are very vertical in that the courses should build on previous courses, and this isn’t possible if all courses have as their prerequisite the same introductory course. This is a side effect of low program enrollment that leads many classes to be offered every other year. The advising check sheet outlines a suggested order of courses for students, and faculty advise students that certain courses should be taken earlier in their undergraduate career and other courses later, but there should be a clearer sequence of courses so that students can build on previous knowledge. Including prerequisites and/or a minimum number of credit hours earned in the major for upper division courses would help reinforce a logical sequence.

D. Technology integration

When the mission of DSU was redefined in 1984, computer technology was not nearly as prevalent in society as it is today. Most universities have course management systems and offer courses that require the use tablets and various other kinds of computer technology. A growing number of institutions loan tablets so that all students have the same devices and can use the same software. Therefore, the ways in which biology students at DSU incorporate technology are similar in many ways to how biology students at most universities use technology. All biology students at DSU are required to take two computer courses, including programming, and some may use their programming skills in their research. In addition, biology majors take SCTC 345 Introduction to Bioinformatics and incorporate technology in all of their coursework. Moreover, the importance of computer technology application in the discipline is stressed by all faculty. Students in the Biology Program at DSU are extremely well prepared to use technology following graduation.

E. Program assessment

The Biology Program began the process of revising its assessment activities in 2015. All assessment measures at that time focused on characteristics of program graduates – performance on the major field assessment test, grades in upper division coursework and GPA at graduation, quality of the research project, placement following graduation, and student and employer surveys. Graduates are, in general, meeting the current benchmarks. There was no means, however, to assess progress through the program and identify potential areas where those students who did not meet these graduation benchmarks were falling behind or to identify why students left the program. A curriculum map has been developed to follow students through the program, identifying specific courses where assessment goals are introduced, reinforced, and mastered. This is an admirable undertaking and the faculty are currently developing assessment measures for specific goals in specific courses. With many upper division courses offered on an every-other year basis, however, students may have to enroll in a course in which goals are to be “mastered” prior to enrolling in a course in which those same goals were to be “reinforced.” For example, might a student enroll in BIOL 343 Cell and Molecular Biology (mastery) prior to enrolling in BIOL 371 Genetics (reinforcement)? According to the enrollment statistics and

the advising check sheet, this scenario is entirely possible. How are students to demonstrate mastery of a goal without adequate reinforcement? This could be a reason some students fall short of meeting assessment benchmarks and is likely to be an issue until the program has large enough student enrollment and faculty staffing to offer the upper division courses annually so that students can progress through them in a more predictable sequence.

F. Student support / student enrollment

As stated previously, Dr. McKay has a goal to greatly increase enrollment at DSU, which would include increased enrollment of biology majors. Enrollment in general education courses (BIOL 101, BIOL 103) and courses taken by students wishing to pursue careers in health care (BIOL 211, BIOL 323) is strong, but the number of majors is small and enrollment in courses specific to the major is relatively low, forcing these courses to be offered every other year. The number of cohorts Fall 2009 through Fall 2016 averaged 7.4. Retention of cohorts to the second semester and on to the second year is good at approximately 85%. It is hoped that the graduation rate of these students will be higher than the rate for the 33 cohorts who entered between 2004 and 2010, because only 7 of these students (21%) graduated within 6 years, well below the university average of 41% over that same time period. It should be noted that there are some programs in the health professions that students may enter without completing a bachelor's degree, which may contribute to the low graduation rate of Biology students. A mechanism to track students who exit the major would be extremely useful to understand the low graduation rate. Biology students meet regularly with a faculty advisor and utilize the advising check sheet to plan not only the next semester's schedule but also to plan a semester or two ahead due to the fact that many classes are offered only every other year. The program has done an excellent job keeping track of the placement of its students in jobs, professional schools, and graduate programs with only a few instances in which the graduate's placement is not known.

G. Program strengths and areas for improvement

The greatest strength of the Biology Program is the faculty, including those teaching the required math and science support courses, and the support staff. The faculty are an extremely collegial group dedicated to providing a positive experience for all students in the program and do so with limited resources, both in terms of financial support and time. Faculty are on 15-hour teaching loads, which can be reduced to 12-hour teaching loads if the faculty member is involved in research. The biology tenure-track faculty at DSU demonstrate the research productivity of faculty at universities with both lower teaching loads and greater resources and they should be recognized for their efforts. As previously stated, the fact that all tenure-track faculty have published at least once since 2015 is outstanding, and all three, including Dr. Patrick Videau who has been at DSU less than two years, seem to have met the criteria for "high performance" in research according to DSU criteria for promotion and tenure. Again, this is particularly noteworthy considering the demands placed on their time and lack of dedicated research space. In fact, their publication records well exceed my university's expectations for promotion to full professor, and my university has a defined minimum number of publications advancement. This is exceptional considering the fact that faculty at my institution who actively participate in research are granted 9-hour teaching loads and have dedicated research space. Their contributions to the DSU community and their professional organizations are also particularly noteworthy. This institutional support is particularly important considering there is the potential for faculty retirement prior to the next program review. Demonstration of institutional support will be very important to future hires and the lack of such support may deter highly-qualified candidates from seeking a position at DSU.

Improvement is necessary in the support of these dedicated faculty in terms of funding support for equipment purchases, student travel, and faculty development. There needs to be a mechanism in

place to routinely request funds to support student travel, particularly a means by which students do not have to pay all their expenses up front and then wait to be reimbursed. In addition, faculty need some relief from the demands on their time related to the one-on-one interactions they are expected to have with all students. As stated previously, even small increases in enrollment that do not necessitate increased frequency of course offerings will require increased faculty expectations with respect to independent study, topics, and capstone courses. While these one-on-one interactions are incredibly rewarding for both the faculty member and the student, any increased demands on the faculty to provide additional quality mentoring will lead to exhaustion and burn out.

Part 4. Recommendations for Change

Major recommendations for change fall primarily under Program Resources (institutional support) with some minor recommendations regarding Program Curriculum and Program Assessment. These areas are, of course, not completely independent from one another and all are critical to the future success of the program. Institutional support encompasses not only funding for equipment but also teaching loads and release time for faculty and support for students. The suggested change in the Program Curriculum will realistically be feasible only if enrollment in the program increases such that upper division courses can be offered annually.

There must be a better means of funding not only the purchase but also the upkeep of equipment unique to the program. A proposal has been made to double lab fees which would increase the annual local funds from approximately \$35,000 to \$70,000. The majority of the students paying these lab fees, however, are not biology majors; they are students in the high enrollment general education courses. One has to question a plan where non-majors pay to make purchases and maintain equipment used primarily by students in upper division courses or by faculty in their research. The carry over reserve is rapidly dwindling, the cost of maintenance and service contracts averages \$19,000, and the program proposes an increase in the annual budget of \$27,000 to support student research. Non-majors should not be burdened with increased lab fees to support these endeavors. If DSU is truly committed to supporting student research, which requires major equipment purchases and upkeep so faculty can carry out their research, there needs to be increased institution support in the form of line items in the budget for both equipment maintenance and student research. In order to conduct high quality research, the faculty and students need dedicated research space, which is currently unavailable in the Science Center. The Biology Program is doing amazing work considering the lack of facilities dedicated to research and should be recognized for their efforts.

Institutional support also includes better mechanisms for faculty to get release time in order to write grants to support their own research. Between structured classes and one-on-one contact with multiple students engaging in independent work, faculty are currently stretched to their limits and do not have the physical and mental energy or time to dedicate to writing high quality grants. Because DSU does not have a long-standing reputation as a research institution, faculty are at a disadvantage for funding before even submitting a grant proposal. One recommendation from the last program review was to consider redesigning the general education survey courses around contemporary issues in biology. While the faculty of the biology program agree with this, none of the faculty has the time to dedicate to redesigning these courses. The faculty need some form of relief, which was addressed in the previous program review. Following the recommendation of the last program review a laboratory manager was hired. This has greatly removed the burden of both organizing materials for the general education laboratory sections and teaching all these laboratory sections from tenure-track faculty, but this individual cannot set up all the laboratories taught by the program because Ms. Gillian Berman simply can't fit that into her already full schedule. What would greatly benefit the program is an additional tenure-track line, specifically a faculty member who could contribute to the courses in the Molecular Biology emphasis. Currently two

tenure-track faculty, Dr. Kristel Bakker and Dr. Dale Droge, have expertise in areas specific to the Integrative Biology emphasis, leaving Dr. Videau to teach all coursework specific to the Molecular Biology emphasis. Dr. Videau also teaches CHEM 460 Biochemistry, giving him seven different course preparations in addition to team-teaching SCTC 345 with Dr. Bakker. During the exit interview either Dr. McKay or Dr. Jones mentioned that he wanted students in the Molecular Biology emphasis to take all their classes from Dr. Videau. While Dr. Videau is indeed a very talented faculty member, as are Dr. Bakker and Dr. Droge, it is not fair to either the students or to Dr. Videau to have all classes in an emphasis area of their degree program taught by one person. Dr. Videau is fortunate to have formed a strong, collaborative relationship with Dr. Michael Gaylor, assistant professor of chemistry at DSU, but he needs a colleague in his own program who can also teach the upper division classes. The program needs a second faculty member whose expertise matches courses in the Molecular Biology emphasis. Selection of the right individual could provide not only Dr. Videau but also Dr. Bakker and Dr. Droge with some relief if this individual could occasionally teach the introductory courses for biology majors (BIOL 151 and BIOL 153 General Biology II) or anatomy and physiology courses (BIOL 221 and BIOL 325). This could provide the much-needed relief for faculty to redesign the general education courses or to engage in grant writing activities as well as spread out the one-on-one contact students have with faculty for research opportunities.

Dependable institutional support is also needed to help students travel to professional meetings. DSU needs to recognize the potential returns on this investment in the form of increased student enrollment. By using concrete examples of student success in marketing campaigns, DSU could attract highly motivated, intelligent students not only to the Biology Program but also to the institution as a whole. Students from the Biology Program have been invited to France later this year to present their work. What a wonderful honor and opportunity not only for the students and their faculty mentor but for the university as a whole! Every effort should be made to send these students to the meeting so they can learn from an international audience and later share their experiences with prospective students. As stated previously, however, there needs to be a better mechanism in place to assist these students in their attendance at professional meetings. The institution needs to develop a mechanism to pay the majority of student expenses ahead, such as registration fees and travel, so as to make the overall experience as positive as possible for students. After all, since the students are promoting the program as well as themselves, DSU needs to step up and support their efforts in a concrete way.

The number of biology majors is very low, as is the graduation rate, which are definite concerns. It is hoped that reorganizing the biology major into two emphasis areas will help prospective students realize that majoring in biology at DSU is not only possible but that specialization is available. Increased efforts are underway to assess the program throughout the curriculum. It is important to know if students who leave the biology program leave DSU entirely or switch to other majors at DSU. The sophomore year is particularly critical as organic chemistry can often be a course in which students do not have success. Once reasons that students leave the major are identified, interventions may be developed in order to increase student retention. In order to attract students, DSU needs to develop a marketing campaign around the two new emphasis areas. Prospective students with the goal of pursuing a career in (e.g.) health care can choose the Molecular Biology emphasis while prospective students who wish to pursue a career in (e.g.) wildlife conservation can choose the Integrative Biology emphasis. Including concrete examples of student success in this campaign could increase the number of high quality students entering the program. With an increased number of students, course sequencing within the major could be better defined. While the advising check sheet on page 44 of the self-study outlines a suggested course sequence, this would have to be altered for a student starting the following year. That is, a student entering DSU fall of an even-numbered year might be able to follow the sequence in the advising check sheet, but a student entering DSU fall of an odd-numbered year could not take BIOL 371 (where concepts are to be reinforced) in the sixth semester because it would not be offered until that student's eighth semester. These kinds of issues are often magnified for transfer students. As stated previously, the

sciences are very vertical in that they build on previous knowledge, and if all courses in the major have only BIOL 151 as their prerequisite this progression isn't possible.

As stated in the executive summary, the Biology Program at DSU is doing outstanding work despite limited resources. The faculty are enthusiastic about their work and dedicated to student success, and the students recognize and appreciate faculty efforts. It is extremely fortunate that the faculty are such a highly collegial group because one uncooperative individual in a faculty this small could negatively affect the entire program. Graduates of the program have a solid background not only in biology but also in the application of technology in biology. While the number of graduates is not large, nearly all graduates go directly on to professional programs, graduate school, or jobs in the field. Increased institutional support could go a long way to increasing both faculty productivity and mental health as well as increasing the number of students in the program. A dependable funding stream to support research equipment is needed to keep the program strong. The Biology Program at DSU has the potential to draw highly motivated and talented students from the region if more prospective students knew of its existence. Development of an advertising campaign emphasizing the unique experiences available to students in the Biology Program could go a long way toward increasing both student enrollment and graduation. In conclusion, the faculty and students in the Biology Program are deserving of more institutional recognition and support because the return on this investment has the potential to benefit not just the program but DSU as a whole.