SUBJECT: Program Review Reports – SDSM&T

The system has established a process requiring periodic reviews of all programs offered. A primary purpose for these reviews is to continuously improve the quality of all educational programs. Periodic program review involves stakeholders in an analysis of past performance which is used to inform present and future directions and decision-making. The review process is integrated with strategic planning and budgeting, with regional and specialized accreditation processes, and with student-learning outcome assessment. The system’s processes require each campus to maintain a schedule that indicates the time frame for the review of every program offered.

For each review, representatives of the program completed a self-study driven either by the system’s guidelines or by those of an external accrediting body, if applicable. An external review was engaged to evaluate the program using both the self-study and interviews of constituents. In each case the reviewer prepares and a report of findings and the campus then prepares a response.

For each program reviewed, the reviewer’s report and institutional response is attached.

South Dakota School of Mines & Technology
- B.S. in Geology

RECOMMENDED ACTION

Information.
I. Introduction/Overview

The formal review of the South Dakota School of Mines and Technology Department of Geology and Geological Engineering (GGE) took place on April 21, 2014, and included an initial interview with the Provost (see Schedule). Discussions with faculty and Head of the Department began on the evening of April 20 at a reception, and ended with activities on the morning of April 22 before departure.

An important aspect to a program’s success is faculty and staff collegiality; plainly, respect for one another and the ability to socialize gracefully. This includes how individual faculty interact with guests and how they portray a department through their demeanor. Although a review visit like mine is brief, understanding the feelings of individuals is not that difficult. There are multiple levels of personal interaction to interpret: 1) the faculty–faculty; 2) faculty–student; 3) faculty–administration (departmental and above); and staff with students, faculty, and administration.

To summarize, I think the overall dynamics of these interactions are good. There are some obvious points of concern to address, some of which were already noted in the comprehensive Self-Study of the B.S. in Geology Program (hereafter referred to as Program). GGE and its integrated programs are poised to move forward given the necessary tools at the administration’s disposal. The Provost recognizes the importance of the GGE programs to the success of the School (SDSM&T). With the appropriate focus and the cooperation of all of the stakeholders involved, the future all hope for should be possible.

II. B.S. in Geology Program Review Evaluation

In any discussion of the success or failure of a Program, the department and the administration must consider how a program has lived up to its vision, mission, and value statements, or how it plans to do so. Often thought of as somewhat glib notions, the more these ideas become living ideals, the more likely the faculty, staff, and administration will work in harmony toward success. What separates good ideas from implementation is practical buy-in with specifics from all of the stakeholders.

A. Mission Centrality

1. Relationship to School Vision, Mission, and Values statements.

GGE recognizes that their Program supports the vision and mission of the School:
• Vision – To be recognized as a world-class technological university.
• Mission – To prepare leaders in engineering and science; to advance both knowledge and its application; and to serve the state of South Dakota, our region and the nation.

The Program Vision (in draft):
• Aims to be a nationally renowned center for training technically superior undergraduates, for research-centered graduate programs, and basic and applied geoscience research and engineering design.

The Program Mission (in draft):
• To prepare students for careers as geologists, geological engineers, and paleontologists by providing strong technical backgrounds, significant research opportunities, and superior field experiences, so graduates are well prepared to live and work in a diverse global environment.

The Program Values (in draft):
• Discovery: Research, innovation, technology, design, lifelong learning.
• Integrity: Professionalism, ethics.
• Cooperation: Community commitment, inclusiveness, opportunity, fair accessibility.
• Noted other possibilities include: excellence, respect, collaboration, service (from Mines 2020 document).

I do not know how the School or Department felt after finally coming to these statements. I hope there was a great sense of satisfaction, followed by the urgency to determine how to make these statements meaningful. As a committee or maybe even as a Department, hopefully, there was universal buy-in to make these ideas more than statements in a report.

2. Relationship to School strategic priorities.

GGE declares that institutional mission and strategic priorities have been the cornerstone of its own strategic planning activities since 2002, and that they have been periodically updated as the university evolves its list of strategic priorities to the current draft version of 2013. Interpreted institution modifications are shown parenthetically.

School Strategic Priorities are:
• Prepare and educate an expanding and increasingly diverse student body (student success).
• Reinforce and increase our research enterprise to elevate educational outcomes and educational development (research).
• Invest in human resources to move the institution forward (people and facilities).
• Define and acquire the critical resources to accomplish shared vision and strategic priorities through enhanced partnerships (people, facilities, and administration).
• Ensure a legacy of excellence through dedication to continuous quality improvement (development).

The Program Strategic Priorities are:
• Meet the increasing demand for high quality scientists and engineers through expanded enrollment, retention, and graduation of a diverse undergraduate and graduate student body.
• Increase the quality of educational outcomes for students while advancing knowledge in science and
engineering through directed research efforts.

- Invest in human capital to move the institution forward.
- Focus on continuous quality improvement that assures the highest academic standards in education and research.
- Partner to achieve financial resources that bring the vision of the institution to life.

3. Relationship to supporting other School programs.

As discussed with the Provost, GGE, and the Program in particular, is a critical element in the strategic plans of the School. As a geologist and paleontologist, I have always felt that Earth sciences have a key role to play in society. With today’s energy needs and the demands for engineers and scientists (STEM-based experts), the School is poised to take a leadership position. Even with its small size, the scope and specific attributes should be appealing. The Self-Study reports on this history, where prior to the 1980s, indicate major and independent oil companies regularly recruited School graduates from many of our majors. In the last three decades, School has become less visible than our regional peers, although we continue to provide high-quality hands-on training in areas relevant to the petroleum industry. An important question to answer is why? Dwelling on the past is not critical, but insight might be gained so as not to repeat mistakes. The mid-1980s was a hard time for the oil industry, however, some universities suffered less than others. Why? Is the answer specific to the Program, or is it more systemic to the institution?

In summary, Mission Centrality is well addressed by the Program review. However, the document could and should integrate the vision, mission, values, and strategic points directly into how the Program functions and has or will achieve its goals. Results need to be seen as a byproduct of Mission success. I think this approach gives stakeholders, administration, faculty, and students a sense of pride and direction.

B. Program Quality

How does one judge program quality? When can one say they are happy or proud of what they have achieved or know they are on the right path? One way, as noted above, is when they have fulfilled their Vision and Mission statements and are living up to their Values.

GGE decided to assess Program quality on the basis of a wide variety of measures. Some of these were addressed during my onsite visit. A factor that seems missing from the otherwise comprehensive Program coverage is student and/or post-graduating student input. Student perspective is invaluable to gain perspective on Vision, Mission, and Values. Key elements to assess the program and gain perspective is from: 1) students currently enrolled, which establishes a rapport that may not currently exist; 2) successful students that have graduated; and 3) those students who failed to graduate.

As with most colleges of SDSM&T size, Program faculty have chosen an unstated “teacher-scholar” model. In an active-learning teacher-scholar model, a student takes a central role in their own education. This works when the students are motivated. Entrance standards are important for students and parents to understand what is expected.
1. Learning Environment

GGN states that it offers students, at all levels, training in geology, geological engineering, and paleontology with opportunities to interact and collaborate with faculty, thus creating a high-quality interdisciplinary learning environment.

- Understanding the discipline from different perspectives (e.g., diverse ethnicity).
  - OSSPEEC (Dr. Sawyer), 14% increase in women in 13 years, 4% increase in international students.
  - International travel through field camp, and others that attend field camp (but there is a significant financial cost).

- Practical learning in the curriculum.
  - Field and lab learning; undergraduate senior research project with a faculty mentor; this is a good capstone program, if the coordination between faculty and student is fully realized.

- Technology in and out of the classroom.
  - Tablet Program (students think it is an expensive program; some faculty, also).

- Utilization of library resources.
  - Required, especially for faculty and student research; electronic journals still limited on campus.

- Expanded learning and service opportunities.
  - Encourage and facilitate expanded and service learning opportunities. For instance, the GGE seminar series, which is held weekly during the academic year,
    † Includes presentations by faculty, students and visiting professionals from other universities, agencies, companies, and professional societies.
    † These presentations expand the perspective of our students by showing new techniques and innovative research approaches. These seminars also demonstrate professional presentation methods and provide a better understanding of the steps needed to complete a research project with high-quality outcomes.

- Students are encouraged to participate in regional and national meetings organized by scientific associations to help them to improve their oral or written presentation skills. These activities are partially supported by the Department.
  - Do students receive rubrics to evaluate presentations and posters? Do students report on their experience? Attendance alone does not result in maximum expectations or gains.

- Faculty members promote student internship opportunities whenever possible. The School hosts a career fair every semester, and typically 15–20 companies with specific interests in hiring geology and/or geological engineering students attend.
  - Careers fairs are valuable opportunities for students to practice interviewing skills, meet with potential employers, and get hired. I assume that the School maintains a Career service beyond the career fair.

The Self-Study noted that internships go up and down (markedly) in the Program. Without hypothesizing to a great degree, large changes may reflect the small sample size. However, compounded with students attending field camp, as suggested, may be an important contributing factor to fluctuating internship numbers. Most nongeology engineering programs use internships in lieu of field camp for gaining practical and professional experience. In addition, students pay a significant dollar amount to attend field camp, which may limit students continuation in the program. Internships, however, more often than not provide income for the experience received. Geology and geological engineering programs may wish to consider how certain internships fulfill some or all of the field camp.
requirements. Field camp data is used extensively for ABET accreditation. Skills learned through internships may be equally well applied to ABET if similarly documented.

- Student organizations are one effective way to create collaboration, respect between peers, School spirit, and discussion within a department. The Program has five fully functional student clubs and/or professional organizations:
  - AAPG Student Chapter,
  - Paleontology Club,
  - Society of Economic Geologist Student Chapter,
  - Society of Petroleum Engineering Student Chapter, and

These organizations are discussed in the Self-Study report, which recognizes that these groups play an important role in the life of GGE. An interesting message from the visit was that these student groups apparently are quite self-sustaining. They are student run, with minimal input from the faculty, and these groups organize the few social events held by GGE.

My meeting with students suggested that student organizations at GGE appear to be functioning very well and serve an incredibly valuable role. I do not want to overstate how important this role may be, but students seem to rely more on each other than they do on the faculty. According to faculty, student groups largely organize many departmental functions to which faculty and other students are invited. This includes major events, like the fall potluck. I am told that there is some activity every week. The faculty/administration may consider how to maintain this success, as needed, through their faculty advisors. My understanding is that faculty advisors vary in their value to the student groups.

Students in charge of these organizations could serve as spokes people for the students at faculty meetings or other appropriate functions. Discussions with at least some students seem to suggest that communication channels between faculty and students did not have a regular pathway. The lack of student input in the Self-Study would appear to support this contention.

2. Curriculum

As I will note later, GGE faculty need to collaborate meaningfully toward common successful goals. This collaboration includes curriculum and ABET. All students, regardless of subject, take common courses. I was surprised to learn that this included students involved in Paleontology, where emphasis might be placed in courses more relevant to that discipline. All faculty are involved in ABET assessment. Coming from a program where this is not the case, and assessment is more complicated, integrating assessment responsibility is key to understanding and harmony within a department. Program faculty need to share these assessment goals with students so they can participate in the process.

3. Assessment

The Program is assessed in a variety of ways at a variety of levels. Not all of these methods or outcomes are
discussed in detail in the Self-Study, but the implication is clear that, where appropriate, rulings, policy, and advice are followed (e.g., change in number of Program credits). Assessment reviews include Regental, Institutional, General Education, ACT student exams, ABET accreditation, Program, and Course.

ACT Collegiate Assessment Academic Proficiency (CAAP) exam of all students is administered after students complete 60 credits of coursework. This assessment tool has value if used with care. The results are used to compare School students to national norms. However, students may not be at the same trajectory in their college careers, which may easily bias results, depending on sample size. Used on a student by student basis, the results may help with advisor counseling to understand student progress.

Students also take the ACT Student Satisfaction Inventory (SSI) at the end of their sophomore year. Results are tabulated for each program and made available to Department assessment teams for analysis. Evaluation of this tool is considered tricky in as much as many of the courses taken by the students up to this rank are outside the Program and, thus, do not reflect directly on it. Creating a modified rubric is being considered.

ABET assessment applies specifically to the accreditation of B.S. in Geological Engineering degree. Because significant crossover exists between the geology and geological engineering programs, the assessment activities for ABET involve all faculty and include many courses in the B.S. in Geology curriculum. I am very much encouraged by the comment that this activity “enhances and invigorates review of the geology curriculum.” Discussions with geologists and geological engineers seemed to support a strong collaboration.

The Program curriculum is regularly assessed by the Geology Curriculum Committee and revised accordingly. The activities at this level are described in the Self-Study. Important changes have been suggested in terms of suggested concentrations (petroleum related). Faculty have also noted the need for additional advanced biology courses to support the Paleontology program.

Course assessment by individual instructors should not be undervalued (although it is the hardest to evaluate). Frequently, faculty are accused of using notes from lectures long past. Many, if not most, faculty are interested in updating pedagogical approaches and using new initiatives found throughout science education. Student opinion surveys and data from student success on assignments and exams may suggest the need for such change, but the profession and methods for educating students are in a state of flux. As noted in the Self-Study, updates in methods and advances are advocated by many for faculty development training and/or professional advancements in their specific fields.

The Program has and recognizes the advantage it has over other programs in its proximity to the Black Hills, the Badlands, and other rock outcrops. The Self-Study notes that it takes full advantage of the local geology to use as an “open lab,” which is for all intents and purposes a flipped classroom (if used appropriately).

Previous Assessment of the B.S. in Geology Program included an extensive effort to prepare for the 2006 Higher Learning Commission (HLC) assessment visit. Annual data gathering, reviews, and reporting were followed for four years through 2005. Six methods of assessment were defined by the plan:

1. Course portfolios: Scoring of selected assignments from targeted classes against program outcomes, using rubrics developed for the purpose and performed by a team of faculty.

Program Review, p. 6
2. Evaluation of senior research reports against program outcomes by a team of faculty.
3. Senior exit surveys.
4. Alumni surveys.
5. Presentation of assessment results and discussion with the GGE advisory board.
6. Review of other geology programs.

The Self-Study stated that this effort lost momentum after the HLC visit, with a change in Department and Program leadership. The Self-Study indicated that formal assessment activities largely ceased, although informal assessment and improvements continued. The Program recognizes the challenge to develop and follow a reasonable, efficient, and useful assessment plan that has not received consistent attention. A challenge met by today’s Program administration is continuity of effort and the apparent greater number of tasks to be undertaken. If the HLC activities could have been maintained, the legacy for Program assessment would be far different than it is today. The Self-Study recognizes that any assessment activity needs to be efficient (not “onerous”). I would hope that the acquisition and integration of data gathered for ABET would provide a valuable and familiar structure to supercede the old review process. Two completely different assessment routines are difficult for relatively small, merged programs.

Noted ongoing activities include remnants of the original plan.

- Mission and outcomes.
  - The outcomes met by each course are listed on the course syllabus; revised most recently in 2013 (Appendix C-2), to ensure that all outcomes continue to be addressed by the curriculum.
- Evaluation of senior research (capstone course).
  - I agree with the Self-Study that an undergraduate Senior Research project is invaluable evidence to indicate the success of the Program. The question always arises is to how to address specific successes or failures (and need for remediation) to the program from any given student project or presentation. This assessment process can serve many functions depending on how much time and thoughtfulness goes into the effort. If there are many students to be evaluated (document to presentation), faculty may not be inclined to be thorough. Well-defined mission and value rubrics may be the best approach. As indicated, an oral rubric is a good start, but a rubric for the written component might seem worthwhile.
  - One suggestion for student learning is to provide the student with the opportunity to self evaluate. Record the student’s performance at mid term and at final presentation. Let the student evaluate their own performances and let other student’s critique each other’s performance (by rubric and conversation) in real time. Feed back can be valuable in the proper environment. Give the student a copy of both presentations (mid term and final).
  - Do students present their senior work at conventions (e.g., South Dakota Academy of Science, or regional or national meetings)? Is the senior work on file in the library? All of these final efforts provide gravitas to the students trails and tribulations.
- Course portfolios.
  - As ABET requires course portfolios in relevant courses in the Program. Hopefully, additional course information can be collected toward general compliance. The advantage for collecting this information, which should be generally accessible in any case, is that it would be available to students. Students should understand the assessment process, why it is undertaken, and how they can learn from it. In most ways, students can participate in the data gathering activity.
- Senior exit survey.
- Recognition that the Senior exit interview is an important tool in understanding the success of a program was indicated in the Self-Study. In addition, students can be encouraged to stay in contact with the Program. Students can be given the means to discuss a follow-up review a few years hence. The gold standard of assessment information is understanding the value of a student’s education through the challenging first years of getting and keeping a job.

- GGE Advisory Board.

- The Self-Study stated that the Geology and Geological Engineering Advisory Boards were combined and enlarged in 2011 and now receive regular reports of Department and Program activities. Depending on how these boards function, their make-up, and the ability of the Department and Program to implement suggestions, the GGE Advisory Board could be invaluable in arguing on behalf of these entities for enhancements and needed modifications.

4. Equity and Diversity

GGE has recorded higher gender equatability than the campus-wide and national averages for students and faculty. The Program is also on par with national averages for minority participation in geoscience programs. In meeting with students, a good mix of women and men were present, but women students were decidedly the more outspoken. We discussed specific genre issues. One that resonated was access to female bathrooms on all floors in the GGE building. Because of course scheduling conflicts (back to back, as a simple example), women students are not able to visit a bathroom conveniently and thus be late for class. They considered this a Title IX concern.

Subsequent to my visit I learned that “The lack of women's bathrooms on the first and third floor of the building is well known to all women faculty, staff, and students who use the building and the latter two groups have made periodic requests to facilities and the administration to remedy it. The bathrooms were renovated several years ago but, inexplicably, the male restroom on the second floor was made co-ed, but no attempt to provide female restrooms on the other floors was made” (Maribeth Price, August 2014). Apparently, this is a failure of the School to address a long-standing problem despite faculty and student concerns and repeated requests. I found the subject interesting in that UND has had a similar problem, but similar discontent female students. Coed bathrooms were as closes as we have come to a solution. The students Title IX argument puts this topic on a different playing field (as it were).

The reason for the current decline in female undergraduate students pursuing a B.S. in Geology degree is unknown. Complicating factors include such things as availability of scholarships to women (with high enough GPA averages) and other demographic issues (noted in the Self-Study). Because of the current leadership and faculty composition of these units, the opportunities are good for female students and female faculty to want to enroll or be hired in GGE and the Program. I do not know how much either gets advertised, but their booth is well visited at GSA annual meetings and the Black Hills field station is widely known – both are a good reflection on the School and the Program.

A consideration for increasing selection toward equity and diversity is increasing the size of the stipends offered. Through conversations with the Provost and Head, I understand that GTAs and other remunerations are relatively low and not competitive. Also, faculty research needs to be better known. Faculty Web pages (especially by young and female faculty) needs to be improved immediately (a comment made by a number of faculty). Unless I...
missed something, other than at conventions and local outreach (like Dr. Sawyer), there is little promotion of the faculty. Research publications are important to establish credibility, but these likely miss a fair number of undergraduate (or even graduate) students.

The Department and Program have ongoing Native American diversity initiatives. I cannot judge if a 3% to 8% average of total enrollments (during Fall 2008–2013) is a significant number, but the efforts seem substantial. Two additional important considerations are the educational value provided to Indians and the jobs they are able to have as a result of the education received. These result from the activities of a well-defined subset of the Program’s mission, values, and strategic plan directed toward Native America. As suggested, successful outcomes very likely need to be tailored to different expectations. The Program is invested in Pre-Engineering Education Collaborative (PEEC), Gaining Early Awareness and Readiness for Undergraduate Programs (GEARUP), and Tiospaye. In discussions with the program director/advisor, Dr. Sawyer, these programs have varying degrees of success, but this may depend on the rubric being used to measure value to the individual or community.

The Self-Study notes that members of the GGE faculty participate in the annual Women in Science Conference (sponsored by Women in Science and Engineering) aimed at supporting young women in middle school in the Rapid City area. These are important activities and women geologists are role models for women, as well as men. The Program is in a good position to contribute to this end with its current leadership.

I am not in a position to fully evaluate the accommodation given to different learning styles via the use of different pedagogies and instructional methods. Although different course designs may be available, this difference may not be generally applicable to different learning styles in a degree program. However, the Program recognizes that field exercises, laboratory experiences, and in-class active learning opportunities are important to address geological problems and situations. This provides a reality important to student comprehension (beyond the textbook). That the Program takes advantage of the “Black Hills laboratory” is to be commended and should be recognized in its promotional literature.

Field camp is noted as an important element of the Program’s cultural and global experience. Of all of the potential camp choices, only the Black Hills and Turkey field camps fulfill GGE’s field camp requirements. As noted, however, the international trips are meant as elective camps, generally filled with students from other institutions (many of which do not require a traditional field camp) (Maribeth Price, August 2014). As a consortium member, UND previously viewed these camps as potential substitutes for the more adventurous student, along with some conditions. These included approval of the student’s committee and School director with the knowledge that additional work would be involved by the student. An example would be Dr. Putkonen’s students spending longer in Nepal to map and measure section on projects. Our faculty would concur with the proposition that “traditional field mapping [is] the keystone of field camp and the capstone of the geology courses” (Maribeth Price, August 2014). I agree that it does seem odd to offer camps that we know our consortium students generally will not take (or cannot afford). Dr. Price points out, however, that from its inception the field station has served a much larger constituency than GGE alone. UND will review its current policy on field camp substitutions.

5. Faculty Development

A typically underfunded component of University life is faculty development. The Self-Study indicates that
“Geology faculty participate in activities that keep them up-to-date in their disciplines, use current knowledge and strategies to engage students in active learning, and rely on the scholarship of teaching and learning to ground their evidence-based instructional practices.” I suggest that although this quote may have truth, it is largely overstated.

Types of activities included are 1) at least one to two national or regional conferences a year; 2) regularly review of proposals and manuscripts; 3) review of NSF and other proposals (including international); 4) workshops (ABET, GIS, and departmental program reviews); and lead and attend field trips for conferences and geological societies. The Department also supports a weekly seminar series that brings in guest speakers to campus. To be of significance, the faculty member needs to be a regular contributor at a national meeting and likely at a topical meeting related to the discipline.

The question should be raised – what developmental activities provide faculty with truly constructive benefit? The faculty indicate that the local School funding availability is insufficient to attend even one national conference a year ($500/yr). Registration alone can take a huge bite out of that amount. Travel and hotels at big-city meetings add up to $1000 to $1500 easily. Without a grant/contract, faculty pay out of pocket. Many faculty are willing to contribute to their own success in lean years, but this personal funding may not persist if other factors (e.g., salary increases, publications, success with students) do not keep pace. I would argue that attending meetings is a critical element to being “kept up to date” in that it affords the possibility of interacting with colleagues and students at a critical juncture of excitement. If faculty do not attend meetings, they are sending the wrong messages to their students and lose a connectivity with new and old colleagues that is hard to match. Meetings force a scholar to focus on where they are at in their research and, hopefully, that of their students. The School should reflect on its funding policy, recognizing the value of being able to send faculty to meetings, meeting alums, and having a presence. The South Dakota School of Mines already has great name recognition; it needs to have that recognition tied to programs, individuals, and scholarship.

6. Scholarship and Service

A School strategic goal includes moving it from a mainly undergraduate teaching institution toward a full-fledged research university. The Self-Study reported that faculty activities and performance expectations have been in flux for the last six to eight years. The School provides and regularly updates performance standards for faculty and guidelines for promotion and tenure. The most contentious topic in these transition periods, to a “research” university, is work load and external support issues. Even in states like South Dakota that are not in specific economic trouble, schools are expected to share a much greater cost of educating students. Some faculty feel their role becomes that of a money hustler and not as much a teacher/scholar; they do not see how all of the new expectations (work load) is compatible. They ask: “Does anyone really have a vision for how this will all work?”

Faculty are asked to seek funding in the new world order where money is hard to get for what they teach and are trained to do (yet still relevant to students; University vs. Phoenix model of education). Faculty are not wrong, but the teacher/scholar/fund raising model is certainly inevitable. The Phoenix model of education is not superior to the School of Mines approach, but how long will it be before quality does not matter?

Implementation of a well-thought out and explained program is key; quality of the experience is critical, you get what you pay for are cliches, but true expressions of the service and scholarship offered at a winning Program.
To reduce individual faculty anxiety, a development plan for success and how it will be implemented and funded should be designed and reviewed on a yearly basis. The target accomplishments toward various ranks and ultimately professor should be mapped out. New and old faculty alike should never be in the dark about the requirements to achieve specific goals. Though achieving certain goals is never guaranteed, there should be safeguards to avoid misunderstanding, delays, or inadvertent problems that all too often encumber the process.

The University, Department, and **Program** also need to be held accountable. Changing initiatives is fine, but not at the short-term expense of loyal faculty. As the life-history of faculty at an institution can span many years, there needs to be the knowledge that regardless of most circumstances, development plans will be considered of value in reviewing programmatic changes effecting individual faculty. To this end, the percentage distribution of effort among teaching, research, and service is a matter that each faculty member negotiates with the Department Head in terms of the development plan for the individual. The School needs to recognize the sanctity of this contract and the faculty their dedication to the School.

The role of service on any campus is important and a frequently misunderstood activity. GGE faculty appear to be actively involved in internal and external endeavors. Besides the accomplishments associated with these activities important to the functioning of the School, faculty learn how the School and Department works. This is of value in explaining operations to others at faculty meetings. Getting “things” done on campus frequently is knowing who to call, which means participating in committee activities. Hopefully, besides these straightforward positive aspects, GGE can make a difference by being on committees that have a say in the decision making process. Faculty might also learn that the administration is not against them.

### 7. Academic Advising

The School and Department appear to have given undergraduate advising considerable thought; implementation of new policies and procedures may further improve advising and/or student’s recognition that seeing an advisor is good to do. Of the following subjects, only “peer advising” was discussed at any length during my visit.

With all of the initial advising that students receive (and contact with professors), I am surprised to read that some students do not meet with their advisors/supervisors/mentors. In a conversation with one of the students, the comments were made: I live off campus, I don’t get messages for events or activities and, with my work schedule, it is inconvenient to be around much. One of the fellow students commented that this person had the responsibility of knowing what was going on and making time, but that making connection to the School off campus was a problem. My understanding that most nonfreshmen live off-campus.

I provided the above notation to indicate that students, maybe even a good students, can find a ready excuse for not participating in activities in their own best interest. One can shrug their shoulders and say it is not their (faculty) problem, or look for a solution. The student likely needs to be more involved with why they are in school. A supervisor of the student’s research may need to play a more important role at an earlier stage in the career of the student than an assigned well-meaning “class” advisor.
Although relatively long, the synoptic list below presents the advising opportunities available/required of Program students. If administered to the extent presented with knowledgeable faculty, students are getting their monies worth.

- Faculty advisors specify office hours for 3 to 4 hours each week.
- New freshmen in the Program are enrolled in IS 110 Explorations interdisciplinary course their first semester. This will help mentor students in various topics related to campus academics and procedures in order to encourage retention and academic success. Geology students are assigned to the section led by the geology faculty member. This faculty member is the academic advisor for geology freshmen, with those students reassigned as sophomores to another advisor for the remainder of their undergraduate program.
- The freshman advisor initiates a student advising file which includes a curriculum checklist ordered by semester, and indicates the career goal of the student. A copy of this initial checklist, with notations of current courses and courses to be taken in the next one or two semesters, is provided to the student to guide his/her registration and progress through the program. The advising file is accessible to the subsequent advisor and other faculty as needed.
- A faculty member serves as the advisor for transfer students and works closely with the Admissions Office, etc.
- Each semester, the campus provides peer advisors to interact with undergraduate students, and advise them on a variety of topics, but especially registration for courses and career planning. The Department faculty recommends a junior or senior student, one from geology and one from geological engineering, to be selected as peer advisors. Peer advisors are paid a $500 stipend per semester.
- Being a field-based science, geology offers opportunities for interactions between faculty and students on field trips organized by student chapters, as well as during monthly meetings of the chapters. This contact promotes informal advising and helps reach out to students.
- The institution administers the Noel-Levitz Student Satisfaction Inventory (SSI) to all sophomore students at the time that they complete the SDBOR-required CAAP exam. These are usually students in their 4th semester. Results of this survey are compiled and updated in a spreadsheet spanning at least 9 years for all programs.

Questions related to advising include:

- My academic advisor is approachable Range 4.3–5.5
- My academic advisor is concerned about my success as an individual 4.5–5.7
- My academic advisor helps me set goals to work toward 3.8–5.8
- My academic advisor is knowledgeable about requirements in my major 4.7–6.0
- Major requirements are clear and reasonable 5.0–5.7

The responses are requested on a scale of 1 to 7. The ranges above are for the geology program for the period 2008 to 2013, and students responding each year number 9 to 16. There are no noticeable trends in the data. One problem with the SSI implementation is that students evaluate advising based on only two years of experience during a period when they are largely taking general education courses in other departments. A great deal of advising and rapport is built during the junior-senior year. As part of an effort to evaluate and improve our advising, we plan to administer the satisfaction survey to graduating seniors as well, to see if advising satisfaction changes with more student experience. Additional questions regarding advising will be added to our exit survey for graduating seniors. In addition, new faculty will be mentored by experienced faculty on advising procedures.
• From the faculty perspective, a key problem with advising occurs because some students make little to no effort to contact their advisor, or respond to contacts from the advisor, and may get into scheduling difficulties when they “go it alone.” In our perspective, many students who say they are “dissatisfied” with advising are those who have made little effort to interact with their advisor, even when invited.

• First, the campus has implemented an online early alert system called Starfish, which allows faculty instructors and advisors to flag a student for poor attendance, poor performance, attitude issues, etc. This automatically alerts other stakeholders (advisors, coaches, instructors, and academic counselors) so that they are aware of any behavioral patterns, and can intervene as early as possible to get the student on track to success. Notifications can also be made that inform stakeholders of positive and noteworthy performances or activities by the student.

• Second, a new student planner addition to the WebAdvisor software is scheduled for implementation by Fall 2014. It will allow students to more easily plan and implement their schedule for multiple semesters, and includes a review function for advisors to provide feedback.

8. Undergraduate Student Retention

Retention rates are a major concern of many programs including GGE: “Overall, as a Department we are dissatisfied with our overall retention and graduation rates.” “The retention rate has fluctuated over the years, showing no consistent trend.” As funding for education gets tied to graduation rates, understanding 1) how to count students toward graduation, 2) why students leave a Program, 3) how to retain them, and 4) how to accept students into the program that are most likely to succeed, all become critical and complicated tasks. One could argue that you can do your job better than anyone else and still fail because you did not know how to report what you accomplished. GGE stated that “a study of retention and advising was initiated in Fall 2013, but was postponed when we were notified of this institutional review. It will be a priority for 2014–15.” I look forward to reading it.

9. Graduate Advising

GGE has a straightforward graduate student advising plan. Although no form or tabulation document is mentioned, I assume that there is someway to keep track of each student and their progress through the system. In addition to the procedures noted below, students and advisors/ supervisors should consider how a project should be funded. Projects typically require student travel for research and presentation at conferences. Supplies and/or analyses may also require funding. Students should subject a proposal to their committee that fully documents their understanding of how their project will be accomplished.

A synopsis from the Self-Study is as follows:

• New students are assigned an initial faculty advisor, someone interested in working with that student.

• New students are notified of a meeting with their initial research advisor and another faculty member to 1) review their undergraduate background, 2) discuss their intended specialization within geology, 3) develop a tentative multisemester course plan, and 4) determine possible research opportunities.

• In their first semester, students are enrolled in a 1 credit course, GEOL 700 Research Methods, designed to facilitate their transition to graduate program expectations.

• In GEOL 7000, students get an overview of research in GGE with emphasis on research methods in geology, and prepare a research proposal.
• Students will attend campus Graduate Division orientation sessions for new domestic and international students, and annual meetings to provide instructions on preparation of theses and dissertations.

• Graduate students, along with the major professor, select a committee of three (MS) or five (PhD) faculty, including one from another department. [how quickly in their program]

• The student prepares a Program of Study (POS) according to graduate program guidelines that includes courses appropriate to his/her specialty.
  - The committee must approve the POS, and
  - The POS is checked by the Head to make sure that it meets departmental requirements and
  - By the Office of Graduate Education to ensure it meets university requirements.

• The student prepares a research proposal, and the major professor works closely with the student in directing research progress,

• The project culminates with a public presentation of the research findings and a defense of thesis/dissertation.

10. Distinctive Contributions

GGE is fortunate in having major distinctive assets to draw students of diverse interests to its Program. Having paleontology a part of this mix (in GGE) is unusual, but an opportunity not to be understated or undervalued (and I doubt that it is). The degree to which the Program, GGE, and the School succeeds can, in part, be tied to how much it is willing to invest in programs that draw a crowd (students), alums, and investors. The School has the:

• Only degree-granting geology and geological engineering program in South Dakota;
• Only degree-granting Master's degree in Paleontology in the USA (in North America?);
• Museum of Geology, with a long history in displays in the heart of the Campus at the foot of the Black Hills;
• James E. Martin Paleontology Research Laboratory, a new fantastic facility with tremendous potential to engage volunteers, and;
• Black Hills Natural Sciences Field Station, the premier summer geology and geological engineering research camp, now, with a program of other camps around the world.
• Although not part of the SDSM&T, the Sanford Underground Research Facility (formerly Homestake Gold Mine) provides access to a dedicated deep underground research laboratory for physics, biology, geology and engineering research. GGE faculty and students are actively working in support of the lab development and the potential for unique research opportunities in the areas of geomechanics, geophysics, hydrology, geothermal potential, Precambrian structural development, and gold mineralization.

These distinctive contributions to the education of South Dakota students and the market share they should draw needs further investment to enhance the future of the Program and GGE. As noted, this summary of selected key features is enhanced by location, where geology can be explored readily in the Badlands and Black Hills. Other offerings that track on current technologies and needs will also encourage students to enroll (e.g., Geospatial Technology, Petroleum Systems), but all of the fundamental building blocks are in place if the Program’s reputation is sound and students recognize there is value of the offerings.

As mentioned, GGE and the Program have a major asset in the Black Hills Natural Sciences Field Station. Besides the field experience and access to equipment for other GGE uses, the field station brings together students from all over the United States. Students are provided with an excellent chance to learn from others and make...
contacts. Students need to understand how to use this opportunity. As faculty, we know that meet and greets can lead to research opportunities. Students likely need to be made aware that social situations can have multiple outcomes.

A distinctive component and an important part of its outreach mission is the Program’s work with Native American students. The goal of these largely externally sponsored programs is to increase retention of Ogalala Lakota College students in pre-engineering and engineering programs. As an example, the NSF OSSPEEC program integrates project-based service learning and undergraduate research projects and has successfully guided four Native American students into mainstream science and engineering programs at SDSMT. Importantly, the institutional participants in the program have learned how to work with one another to meet the needs of the students. As discussed with Dr. Sawyer, GGE coordinator of some of these activities, how do we sustain what are relatively inexpensive programs when primer funding (e.g., NSF stipends) is no longer available. Unfortunately, there are no ready answers.

A time-honored expectation of academic geologists and paleontologists is that they offer educational opportunities and services to the public. At a minimum, when the person has a question about a rock or fossil, we will try to answer it. This particular (peculiar) service may also occur in other sciences, but it is certainly common expectation in regard to fossils and supposed meteorites. Getting students involved in these public service activities, as educational opportunities, is very worthwhile. The Self-Study describes a number of chances for education and service to the public. These involve workshops, summer youth camps, visits to campus, and other services. In addition, GGE faculty have served as advisors to government agencies (e.g., national disaster remediation, paleontology mitigation). With this good list of activities, I was wondering if GGE had an outreach coordinator? I am aware of the School’s periodic publication, but does it have a person, who not only keeps track of public service-type activities, but a way of letting stakeholders know what has been accomplished on behalf of the Program. This type of activity could be undertaken by a staff person or an interested volunteer. Few programs truly know of all that is done in the name of the School unless someone asks.

11. Staffing Levels

Although not discussed at any length, an important discussion topic is GGE staffing. The Self-Study describes the Program condition and its concerns. Not to over simplify, these issues are:

- The bimodal distribution of faculty rank (young vs. senior).
- Transition between retirement and new hires.
- Competing interests for hires with industry (salary issues for good hires).
- Transition from teacher/scholar emphasis to teacher/research scholar supported by external funding.
- Numerous degree programs and assessments, with additions to accommodate new energy interests.
- Increase in enrollments outstripping current resources.

Provost Hrnčíř made clear that the School is putting GGE and its programs at the forefront of its initiatives to build a successful SDSM&T. This means GGE’s Head and faculty need to design a plan to work through these staffing complications to convince the Provost to invest further in their future. As discussed on campus, increased graduate student stipends to attract the best students is one example. Important considerations are clearly identifying
each degree program’s mission, expectation within funding limits (growth potential), and living up to the strategic plan.

12. Facilities

GGE and related School facilities were toured briefly on my visit in April. With the School having a more singular focus than most, students and faculty are well supported by equipment and space (if snug) designed to purpose. Some facilities are state of the art and some are vintage, as indicated. With growth and age come all of the usual problems of maintaining infrastructure. Keeping up with technology requires ongoing capital improvements unforeseen by administrators not long ago. Specific issues earmarked in the Self-Study report include:

- GGE classroom and teaching facilities cannot support the 5% annual increases in undergraduate enrollment increases mandated by the Mines 2020 Strategic Vision and Plan.
- GGE laboratory sections require "hands-on" training and there is little room for either larger lab sections or increased numbers of lab sections.
- Mineral Industries (MI) building requires renovation because of circuitry, HVAC, and asbestos.
- New space for GGE is a top priority in Mines 2020 Capital Campaign fund-raising.
- GGE is tasked with maintaining large teaching collections of minerals, fossils and rocks for education, training and research.
- GGE is tasked with maintaining and upgrading a wide variety of laboratory and field equipment to ensure that students receive training on state-of-the-art equipment.
- Laboratory equipment, software, and upgrades are supported through a university lab support fee charged to students taking courses with lab sections.
- All undergraduate students are required to participate in the campus Tablet Program. Discussion with students about the Tablet Program were mostly negative. Students felt, rightly or wrongly, that the cost was too high for the product received. Clearly, the idea is good, but if students truly have issues on the benefits, they need to be better explained.
- Although apparently improving, access to adequate library resources is an ongoing issue, particularly with access to journals. As the paucity of library resources remains a significant hurdle to expanding research demands, there is a critical disconnect between the reality of performance vs. the means to perform. Electronic journals are critical to research these days. This is great on the one hand in expediting learning, but unfortunate on the other (a complicated expense). As a past president of the University of North Dakota’s Senate Library Committee, the transition to electronic journals was far quicker than any one administrator would have anticipated. As an example of a common attitude, a top research scientist (a little arrogant to boot) at the University of Michigan said, “if it isn’t available electronically, it (the article) doesn’t exist.” What this statement really means is that research scientists want journal articles quickly and they want access to a broad range of subjects. Smaller institutions need to form consortiums with larger institutions to compete for pricing. The reality is that schools and universities truly need to figure out how to work with publishers and packagers of journals.
- GGE maintains a large number of equipment items. No particular comment is made on this list as to needs, but almost all equipment requires replacement and software upgrades with unfortunate regularity.
- Space for faculty and students is tight. Plans for improving space in a new building should recognize the direct correlation between better space and productivity. Students also perform better when given more
personalized work space; private or minimally shared space produces a better learning and study environment. These are important considerations when viewing the additional expectations of faculty, the hiring of new faculty, and perks offered to productive faculty and students.

III. Faculty and Graduate Assistants

The Self-Study provides an important discussion on the current hires and retirements ongoing in GGE that effect the Program. Of specific interest to this review are the number of GTA positions that are stated to vary from semester to semester depending on enrollment in laboratory sections and availability of funds to support salary. Although this variation makes sense on paper, GGE needs to know on a consistent basis how it will be able to fund its students. Student funding will vary a few ways depending on the degree, student performance, circumstance, and agreement: 1) GTA; 2) GRA; 3) Institutional or other scholarship; 4) Employment, school related; 5) Employment, not school related; and 6) no support (debt, parents, etc.). Students need to know what to expect. The current half-time GTA ($3374/semester) and 2/3 waiver seems uncompetitive. I do not have national averages available, but these numbers are well below what I know for a number of schools. Competitive graduate student support is critical for bringing the best and the brightest to Rapid City.

A. Scholarships and Fellowships

GGE dispenses a significant amount of money to students annually in the form of endowed or recurring scholarships and fellowships. One question I have is how much do students appreciate receiving this money? Our Department tries to make it a “big deal,” but I still get the feeling that the students are quite nonchalant about the whole business. My point is the donors, faculty, and others involved go to some trouble to make these gifts work out; if students are not understanding what is being done for them by the benefactors, what can we do better. Would it help potential incoming students to know that they may receive money that will help pay for their Tablet Program?

IV. Program Productivity

As with many GGE-type departments, it supports a large number of degree programs and assessment regimes, resulting in a reasonable number of overall graduations, but relatively small numbers in each program. In other institutions, such departments also have a relatively large service function, teaching introductory courses to nongeology majors. Additional service functions exist, as noted elsewhere, in regard to public, government, and administration expectations beyond faculty and student research.

As there are common courses to many of the GGE degree programs, the counting together of undergraduate programs graduations makes sense. This is not to say that individual programs should not be successful, just that they will have irregular periods of success depending on external forces. As much as possible, the causes of student enrollment in specific programs should be monitored and compared to regional and national trends.

In regard to graduate students, a realistic funding model should be developed. How many students can be supported on the basis of GTAs. Likewise, over the length of faculty grants and contracts, what is the likelihood of research support. The Self-Study reports, if I understand correctly, that GRAs are not trackable under the current
system. If this is so, a significant factor is lost in what can be offered to students to convincing them to come to Rapid City.

The Self-Study summarizes the issues concerning GGE and Program graduation rates. There are multiple topics that effect what is a relatively complicated set of degree programs with high expectations within a limited funding model with a complicated history. As noted, the number of graduates varies from 2008 to 2013, which makes drawing summary conclusions difficult. With all that GGE and the Program have going for it, the School simply needs to be able to draw more high caliber students that have the expectation to finish. Factors throughout this (and the Self-Study) report note causal agents in bringing students to the SDSM&T, subsequently resulting in their graduation. These include recognizing that the School is a good place to get educated and from which employment is possible. Faculty and students need to perpetuate the buzz that this is so. Not all of your recent alums feel that they got a fair shake. Whether this is so, attitudes need to exist that the current SDSM&T is the place to be (with no surprises). Retention may be a key issue, but an infrastructure is in place that, if working, should promote students staying on campus. Valuable information would be to know why students have left before graduation. Starfish may be helpful, but only if there is a way of implementing it effectively.

V. Plans for the Future

The Self-Study has a departmental strategic plan for the next ten years. In itself, such a plan should be a testable blueprint for the success of GGE fully integrated into its Vision, Mission, and core Values.

As indicated, the Department is strong and moving forward to meet its future goals. However, certain items have been noted in the course of the Self-Study that require further action. Nearly all of these items have received attention in this report. The Self-Study recommends the following items are for immediate action, particularly in the areas of program assessment and advising.

- Review and update the GEOL BS program outcomes (current version from 2002).
- Develop new assessment for senior research presentations, so that all faculty can rate more outcomes.
- Review, update, and implement the GEOL BS Assessment Plan.
- Administer the satisfaction survey to both sophomores and graduating seniors, to see if advising satisfaction changes with more student experience.
- Add questions regarding advising to the GEOL BS exit survey for graduating seniors.
- Mentor new faculty on advising procedures.
- Find additional ways to remind students of critical course sequences (mineralogy, petrology, structure, field camp), including when students switch from their freshman advisor to their permanent advisor at the start of the sophomore year.
- Develop a process to track GRA awards and amounts.
- Set-up a process to track graduate student progress and graduation rates.

The following topics were marked for data-gathering and analysis so that a course of action could be recommended.

- Investigate reasons for the low GEOL student internship participation rate. Encourage GEOL students to apply for internships.

Program Review, p. 18
• Determine why female students are not performing as well as male students academically, making them less competitive for departmental scholarships.
• Investigate reasons why the percentage of female undergraduate students has dropped each year since 2009. Advise admissions of this trend and seek ways to improve the proportions of female freshmen.
• Determine why female graduate students graduate at a lower rate than male students, although acceptance rates, enrollment rates, and scholarship awards for female graduate students are on par with or slightly better than for male students.
• Investigate the factors influencing retention and graduate rates in the degree programs of the Department, and determine which factors we might successfully influence to improve these rates. A study of retention and advising was initiated in Fall 2013, but was postponed when we were notified of this institutional review. It will be a priority for next year.

VI. Assessment of Progress

The Self-Study assessed the overall condition of the Program as good and that it is meeting well the needs of its stakeholders. Although I agree with this assessment, I do not know what rubric was used to derive this conclusion. Key areas to concentrate effort to achieve additional success and understanding are indicated below (derived from a modified table).

Table. Self-Study Future Focus Areas – Task/Metric/Goal

Revise Assessment Plan and maintain a consistent, regular assessment of program outcomes.
A new plan is in place that can be followed without onerous expenditures of time.
A new assessment plan is posted on the departmental Web site, with annual reports summarizing findings.
Improve advising.
Track SSI results at sophomore and senior level.
Improve SSI results to lower the gap to less than 1 for all measures.
Tracking graduate student progress and assistantships.
Publication of annual report on graduate students characteristics.
Report completed and analyzed annually.
Improve participation rate for internships.
Percent of graduating students who have completed at least one internship.
Increase to 60% from current baseline of 30-40%.
Investigate discrepancy between male and female student performance.
Track ACT and GPA of female and male students, collect info from student interviews.
Report on causes and recommendations.
Reverse decline in annual female student enrollment percentages from 50% to 34%.
Percentage of female student enrollment, retention.
Maintain current five-year average of 42%.
Equalize degree success for male and female graduate students.
- Withdrawal rates of male vs female graduate students.
- Number of degrees awarded by gender.
  - Equal withdrawal rates (currently there).
  - Number of degrees awarded is proportional to gender representation.

Improve retention rates, especially after the freshman year.
Retention rates by class.
  - Increase proportion of freshmen retained to 80%;
  - increase proportion of sophomore-seniors retained to 90% or higher.

Improve graduation rates, e.g. percentage of starting freshmen who finish within 6 years.
Percent of freshman graduating within 6 years.
  Increase from current 42% to 60%.

VII. Overall Assessment of Program

Provost Hrnčir states that there are “no weak programs on campus” and that he expects GGE to be a major area of growth – he is depending on it. I agree with the Self-Study, the B.S. in Geology Program and Department of Geology and Geological Engineering is in relatively good shape, overall. That being said, there are many areas and topics that need to be addressed to reach the goals demanded by the strategic plan. Moreover, if actions are not taken, GGE and the Program can easily slip from its currently advantageous position of moving to meet to goals.

As was brought to my attention, South Dakota’s economy is in good shape. Part of what has led the Dakotas into the forefront of economic growth for the nation is what GGE and the Program has to offer (in education, scholarship, and service). After a somewhat complex history with little attention to infrastructure, personnel, and student support, the School and GGE, in particular, are seen as advantageously poised for growth. The expectation to achieve was clearly present in my visit (among some of the faculty). Will the investments follow that prime the pump with the right hires, develop the right relations with industry, and create the research environment to lead the School to achieve its strategic goals?

A. Strengths and Recommendations

A number of GGE and Program strengths were mentioned throughout this review. The strengths far out way the weaknesses, but that is true now, and can change by just maintaining the status quo. GGE has a certain amount of momentum built on the recent successes (e.g., Martin Paleontology Research Laboratory; other infrastructure improvements; the hiring of Dr. Laurie Anderson, etc.). The touting of long-standing accomplishments (e.g., Museum of Geology), looking forward to the promise of new facilities (e.g., capital campaign for GGE building), and explaining well existing quality programs needs to be done now. Of course, undergraduate and graduate students are why we are in this business. How do we get them to come to the SDSM&T and how do we graduate them? I have tried to explain that; more than many schools of your size, which in itself is has advantage for some students, SDSM&T has signature features to offer a geology or geological engineering student. The existing programs are poised to succeed; by limiting expectations, the School can prove to students, parents, and stakeholders they should not come to Rapid City. Simple examples might be for undergraduates – poor unexplained graduation record; for graduate student – poor competitive funding, limited obvious research projects indicated by professors on faculty Web sites; declining graduation rate for women; expensive field camp; low expectation of an internship.
GGE states that it offers students, at all levels, training in geology, geological engineering, and paleontology with opportunities to interact and collaborate with faculty, thus creating a high-quality interdisciplinary learning environment. This is a fantastic statement worthy of a billboard. Prove it! Give a dozen good examples on the departmental Web site and expand on the stories elsewhere (School stories, faculty Web pages, student Web pages).

I have mentioned the strength of the student led organizations and social events. Highlight these organizations and what they do – field activities, weekly meetings, learning activities, etc. The fraternal nature of these events is a draw for many students and important to parents. Learning in groups is critical to success and can establish relationships that last a life time.

Comment on the initiative in Women in Science Conference (sponsored by Women in Science and Engineering) aimed at supporting young women in the Rapid City area. Dr. Anderson is a valuable asset, as Head and Director, in a male dominated arena. She is a lifeboat for women wishing to achieve in geology and engineering, not to mention paleontology. Dr. Shelton, and others, are valuable, well spoken, role models.

Dr. Sawyer and others have laid a good (may be great) educational foundation with Native Americans to enhance opportunities for students in South Dakota. Momentum on this forefront should not be lost. Stakeholders need to be found with the help, if necessary, at the administration level to maintain the good will established. As pointed out, developing the educational experience, regardless of whether graduation is achieved for all students involved is important. The pride of learning and using what is learned is a critical factor in acceptance and good will.

The GGE Advisory Board should play a central role in providing counsel to the geology and geological engineering programs. Who is on the board and who they represent should be recognized by the Department and School. They are stakeholders in the future of both.

GGE scholarships and fellowships represent a significant dollar amount and are given to a significant number of students. I hope that these gifts are well publicized and students and benefactors cheered. These huzzahs are easy and make for good and meaningful celebration.

Program geologists and paleontologists provide many unpaid and paid service functions to the public, government agencies, and to others. Keeping track of activities, posting them, letting the right people know what the faculty is doing on behalf of the South Dakota people should not be that complicated. This goes for students, too. Tours and other outreach activities provide great statistics, some of which are likely already kept. What do faculty advisors do for clubs? What do th clubs do? Professional organizations? Can they all be on a linked Web site to the GGE homepage?

As indicated, the undergraduate senior research project with faculty mentor is a great capstone to the Program, especially if the coordination between faculty and student is fully realized. I have made suggestions about student self-evaluation through taping (digital recording) and other peer review.

**B. Limitations and Recommendations**
The Self-Study lists and describes a number of limitations, some of which are mentioned in this review. Categorized these topics include documenting why certain trends in enrollment/retention have and/or are occurring (e.g., loss of females in Program; irregular graduation rates); inadequate extolling of the value and advantages of an education at the SDSM&T (e.g., lack of adequate faculty Web sites); the lack of adequate (i.e., competitive) and/or regularized support for graduate students; the lack of adequate support for faculty development (as mentioned above); and the apparent lack of significant communication between faculty and students (a common perception; always hard to know the truth). I make the following additional comments.

A good Vision, Mission, and Value statement is made for the Program. My perception is that this set of ideals stands alone from the rest of the Self-Study. I know this is not intended, but a goal would be have this ideals more obvious reflected in the review and future planning.

I do not know the extent to which the School library is limited, but this is a concern that the School has to face. This is not a departmental or Program issue. In the past, departments have been asked to cut journals because of costs. Today, the School is asking its faculty to taking on an increased research role, which naturally means proposal writing, supporting graduate students, and the like. Certain resources are necessarily the responsibility of the School (one way or another).

In concert with the library issue, how do faculty become more productive? What developmental activities provide faculty with truly constructive benefits? Attending meetings and workshops, conducting field work, visiting with colleagues at other institutions? All of these may be possible to jump start a proposal, a paper, or a student project. To write an effective proposal, faculty may need startup funds. There is risk in proposal writing; most are rejected. The rewards, however, are a successful program.

IV. Recommendations

Recommendations are made throughout this review (for examples, see Strengths and Limitations above). The Self-Study provides its own recommendations as noted.

V. Persons Interviewed

April 21, 2014 meetings
Morning
1) Entrance–Overview
   • Duane C. Hrncir, Ph.D., Provost and Vice President of Academic Affairs, SDSM&T.
   • Laurie C. Anderson, Ph.D., Professor of Geology, G, GE; Department Head; Director, Museum of Geology.
2) PRL Tour
   • Dr. Anderson.
   • Sally Y. Shelton, Ph.D., Instructor of Geology; Associate Director, Museum of Geology.
3) Department Tour & EMES
   • Maribeth H. Price, Ph.D., Professor of Geology, G, GE.
• Edward F. Duke, Ph.D., Professor of Geology, G, GE; Manager, Analytical Services, Engineering and Mining Experiment Station (EMES).

4) **Department Area–PEEC**
   • John Foster Sawyer, Ph.D., Associate Professor of Geological Engineering, G, GE; Director, PEEC (Pre-Engineering Education Collaborative Program).

5) **Department Area–Geocomputing**
   • Timothy L. Masterlark, Ph.D., Associate Professor of Geology, G, GE; Geocomputing.
   • Dr. Price.

6) **Department Area–Geological Engineering**
   • Arden D. Davis, Ph.D., Professor of Geological Engineering, G, GE; Geological Engineering
   • Kurt Katzenstein, Ph.D., Assistant Professor of Geological Engineering, G, GE.
   • Larry D. Stetler, Ph.D., Professor of Geological Engineering, G, GE.

7) **Department Area–BHNSFS**
   • Nuri Uzunlar, Ph.D., Professor of Geology, G, GE; Director, Black Hills Natural Sciences Field Station.
   • Christopher J. Pellowski, Ph.D., Coordinator/Instructor of Geology, G, GE.

**Lunch**
With alums at the Firehouse.
• Dr. Anderson, Dr. Price, alum Durkin, alum Noyes, alum J. Carter, plus others.

**Afternoon**

1) **Department Area–Geology.**
• Collin J. Paterson, Ph.D., Professor of Geology Emeritus, G, GE.
• Dr. Duke.
• Zeynep Oner, Ph.D., Assistant Professor of Geology, G, GE.

2) **Department Area–Paleontology.**
• Christina L. Belanger, Ph.D., Assistant Professor of Geology, G, GE.
• Darrin C. Pagnac, Ph.D., Assistant Professor of Geology, G, GE.
• Dr. Shelton.

3) **Work-time for Exit Interview**
• Scheduled, but mostly used for further discussion.

4) **Exit Interview**
• Dr. Anderson and Geology faculty (Provost Hrnčir was unable to attend).

**Dinner**
With Director and Head at Botticelli’s
• Drs. Uzunlar and Anderson.
Program Review Response
Department of Geology and Geological Engineering
BS Program in Geology
South Dakota School of Mines and Technology

Overview
The Department of Geology and Geological Engineering (GGE) participated in a self-study and review for its BS in Geology program in academic year 2013-14. The process included a site visit by an external reviewer in April 2014, Dr. Joseph Hartman, who is the Director of the Harold Hamm School of Geology and Geological Engineering at the University of North Dakota. The geology faculty have met and formulated responses to Dr. Hartman’s recommendations, which can be organized into the following themes: strategic planning, student input into department activities, field camp options and opportunities, curricula, program evaluations, faculty development, funding, graduate programs, and other miscellaneous suggestions.

The overall finding of the Program Review is that the department and Geology BS program are strong and moving forward to meet their goals. Dr. Hartman stated: “GGE and its integrated programs are poised to move forward given the necessary tools at the administration’s disposal. The Provost recognizes the importance of the GGE programs to the success of the School (SDSM&T). With the appropriate focus and the cooperation of all of the stakeholders involved, the future all hope for should be possible.”

As a result of the review process the department has identified areas for further improvement and growth, and included in this response is a list of action items taken from the self-study modified to incorporate Dr. Hartman’s recommendations.

Recommendations of Dr. Hartman

Strategic Planning
- **Recommendation:** Integrate vision, mission, values and strategic points directly into how the program functions and achieves its goals.
  - **Response:** Strategic planning is a dynamic and iterative process. Our strategic plan is a collaborative effort under development in faculty meetings and retreats. At the time of the review the department was still revising and articulating its vision, mission and values statements. We are making the strategic plan a grassroots document that is informed by the institution’s strategic vision as a whole but tailored to the department’s capabilities and aspirations. The program review process in 2013-14 is further refining our goals, action plans, and metrics. In summary we feel we already do what Dr. Hartman recommends, and will look for opportunities to further integrate these assessment and planning activities.

Student Input into Department Activities
- **Recommendation:** Establish regular pathways of communication between faculty and students.
  - **Response:** We agree that the department needs to do more to include student input into issues that affect them. We will develop means to meet regularly with students and solicit input on issues of importance to them, including posting planned curriculum changes with a time period and mechanism for gathering student comments before final consideration.
- **Recommendation:** Include student representatives in faculty meetings.
September 15, 2014

Response: We do not feel that this would be a productive use of time for faculty or for students, as much of what is discussed at faculty meetings either does not affect students directly or is confidential. Instead we will consider establishing regular town hall style meetings between faculty and students, and establish other means to communicate and get feedback from students.

Recommendation: Share assessment goals with students.

Response: We do not fully understand what Dr. Hartman means here, as we do include program outcomes on our syllabi and on our website. Once we have completed the current review of our strategic plan, we will be posting that on our website as well.

Field Camp Options and Opportunities

Recommendation: Have internships fulfill some or all of the field camp requirements.

Response: The faculty feels that field camp is a fundamental part of the program, the capstone of our geology courses, and something that the industries employing our alumni value highly. We do not feel that internships provide a comparable experience. Program growth has enabled us to introduce additional field camp sessions to help students desiring internships to schedule them in the same summer as field camp.

Recommendation: Students should be encouraged to network outside their program at field camps.

Response: We do this now as part of the field camp experience, although we could also incorporate some materials in the field camp handbooks on conduct and networking so that students are continually reminded of these opportunities.

Curricula

Recommendation: All students, regardless of subject, take common courses, including paleontology students. Why are not they placed in courses more relevant to that discipline?

Response: At the undergraduate level, we offer a bachelor’s degree in geology, although we do offer informal focus areas in a number of subdisciplines, including paleontology. Because all students are geology majors, the core courses required are those we view as fundamental to geoscience and preparatory to any geoscience career. The recommended electives that students can use for paleontology or other interests are listed in the catalog and are regularly offered. Feedback from alumni and employers of our alumni indicated that they appreciate that students have this common background. We also feel that students will come to appreciate the core skills they learn when career options and opportunities change due to job availability in particular sectors. Further, the M.S. in Paleontology and in GGE do have separate curricular requirements.

Recommendation: Include self-assessments (tape presentations) and peer review in assessments for Senior Research.

Response: The Geology BS Program Committee will forward this recommendation to the Senior Research instructors and advisors for consideration.

Program Evaluations

Recommendation: Evaluate all programs in a common way that is compatible with the ABET process used for the GEOE BS curriculum.
Response: Although a completely aligned system may not be feasible due to differences in programs and outcomes, as we proceed with revamping the Geology assessment plan, we do plan on integrating ABET procedures and common practices whenever possible.

Recommendation: Include student and alumni input in self-studies for program reviews.

Response: We will plan for various mechanisms, including scheduling town hall meetings, to gather input from students for the next program review. In addition, we will gather input from our Advisory Board members, who include both alumni and employers of our students. Further, the department now has access to the SDSM&T alumni database and a subscription to Survey Monkey, which will facilitate gathering input from alumni. We will also discuss including at least one PhD student on the committee conducting our current self-study (for our graduate programs).

Faculty Development

Recommendation: SDSM&T should provide support for faculty traveling to professional meetings and participating in development efforts.

Response: We agree, although faculty should also endeavor to support travel through external research funding. We see university support is especially important for new faculty who are working to establish their research programs. Funding to support travel for development work by department Heads and other faculty should be a part of the next SDSM&T Foundation Capital Campaign.

Recommendation: Establish a development plan for faculty in the transition to a research university, review that plan yearly, and hold negotiated distributions of effort sacred.

Response: We already accomplish the first two points using the Professional Development Plan structure assigned by the Board of Regents, and through departmental and SDSM&T expectations documents. Generally the negotiated distribution is honored to the extent possible given constraints due to curricular needs and hiring issues.

Funding

Recommendation: Library resources are critical for increased research efforts.

Response: We agree absolutely.

Graduate Programs

Although the review was for the BS in Geology program, Dr. Hartman included some recommendations for our graduate programs that we will consider in the review of these programs, which is taking place in 2014-15.

Recommendation: Graduate students should include a detailed budget in their research proposal to their committee.

Response: This is a good idea and is under consideration by the GGE graduate programs committee.

Recommendation: The department needs to know on a consistent basis how it will be able to fund its students.

Response: Funding of TAs needs to be more strongly supported by the University and establishment of the Provosts Fellows is an important first step. In addition, faculty
should write more grants to fund RAs, which is an expectation for all faculty as we transition into a more research active unit.

- **Recommendation**: Develop a realistic funding model for graduate students and track GRA funding more closely.
  - **Response**: This is difficult for a department to resolve alone, when the Board of Regents and other SD institutions have historically underfunded teaching assistantships. Sudden sweeping changes in policies (e.g., whether or not RAs can be awarded full tuition and fee remission or not) are also a problem. However, solutions need to be found if the department is to compete effectively with other institutions for graduate students.

**Other Miscellaneous Suggestions**

- **Recommendation**: Address Title IX concerns, such as the fact that women’s bathrooms in Mineral Industries Building only are found on the 2nd floor.
  - **Response**: We agree that this issue needs to be addressed in the upcoming renovation plan. Or sooner. We wonder if the bathrooms on each floor should be made co-ed?

- **Recommendation**: Assign a staff member or volunteer to be an outreach coordinator.
  - **Response**: One of our staff members, Dr. Christopher Pellowski, is already coordinating much of this effort. We could establish a reporting function to help get the word out more effectively and use the media relations office to promote events. We also could be better about promoting ourselves on the web page by regularly rotating news items, and creating a procedure for more regular distribution of information so it gets where it needs to be.

**Action Items from Geology BS Program Review Self-Study**

As a result of the Program Review, department faculty developed the following recommendations for action items. Additions to these recommendations as a result of Dr. Hartmen’s review are in italics.

**Immediate action items:**

- Review and update the GEOL BS program outcomes (current version from 2002).
- Develop new assessment for senior research presentations so that faculty can rate more outcomes. *Consider mechanisms for peer- and self-assessment into senior research evaluations.*
- Review, update, and implement the GEOL BS Assessment Plan.
- Administer the satisfaction survey (SSI) to both sophomores and graduating seniors, to see if advising satisfaction changes with more student experience.
- Add questions regarding advising to the GEOL BS exit survey for graduating seniors.
- Mentor new faculty on advising procedures.
- Find additional ways to remind students of critical course sequences (mineralogy, petrology, structure, field camp), including when students switch from their freshman advisor to their permanent advisor at the start of the sophomore year.
- Develop a process to track GRA awards and amounts.
- Set-up a process to track graduate student progress and graduation rates.
• Develop mechanisms for faculty to meet regularly with students and solicit input on issues of importance to them, including planned curriculum changes.

• Complete current review of strategic plan and post on the GGE website.

• Incorporate materials on conduct and networking opportunities in field camp handbooks.

• Develop mechanisms for student and alumni input into future program reviews.

• Establish practices for greater communication of our activities and accomplishments to the wider community.

**Items marked for data-gathering and analysis so that a course of action may be recommended.**

• Investigate reasons for the low GEOL student internship participation rate. Encourage GEOL students to apply for internships.

• Determine why female students are not performing as well as male students academically, making them less competitive for departmental scholarships.

• Investigate reasons why the percentage of female undergraduate students has dropped each year since 2009. Advise admissions of this trend and seek ways to improve the proportions of female freshmen.

• Determine why female graduate students graduate at a lower rate that male students, although acceptance rates, enrollment rates, and scholarship awards for female graduate students are on par with or slightly better than for male students.

• Investigate the factors influencing retention and graduate rates in the department’s degree programs, and determine which factors we might successfully influence to improve these rates. A study of retention and advising was initiated in Fall 2013, but was postponed when we were notified of this institutional review. It will be a priority for 2014-15.