Synopsis: Outdated science facilities and laboratories on public university campuses must be upgraded to support South Dakota’s research initiative and to provide contemporary space for teaching. In House Bill 1085, a $74.5 million state bond to be paid off over 25 years would finance these improvements.

Why are Science Facilities in This Condition?

Every year, campuses identify maintenance and repair needs that far exceed current funding levels. The backlog grows with each passing year, and facilities become outdated over time. Solutions have proved difficult. To date, the state provides no ongoing support for maintenance or replacement of campus facilities. The 1960s-vintage science facilities and laboratories in the public university system are substandard. The following priorities for replacement or upgrade have been identified:

<table>
<thead>
<tr>
<th>Location</th>
<th>Facility or Lab Investment</th>
<th>Bonded State Funds</th>
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</thead>
<tbody>
<tr>
<td>BHSU</td>
<td>Science Research Building</td>
<td>$8,078,400</td>
</tr>
<tr>
<td>DSU</td>
<td>Habeger Science Center</td>
<td>$6,038,670</td>
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<tr>
<td>NSU</td>
<td>MeWaldt-Jensen Hall &amp; Krikac Administration Building</td>
<td>$2,701,900</td>
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<tr>
<td>SDSM&amp;T</td>
<td>Paleontology Building</td>
<td>$7,063,963</td>
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<tr>
<td>SDSM&amp;T</td>
<td>Chemistry/Chem Eng Building</td>
<td>$7,957,700</td>
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<tr>
<td>SDSU</td>
<td>Agricultural Hall</td>
<td>$8,006,275</td>
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<tr>
<td>SDSU</td>
<td>Dairy Microbiology Building</td>
<td>$8,259,250</td>
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<td>USD</td>
<td>Arthur M. Pardee Laboratory</td>
<td>$3,792,104</td>
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<td>USD</td>
<td>Churchill-Haines Laboratory</td>
<td>$6,751,145</td>
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<td>USD</td>
<td>Akeley Lawrence Science Center</td>
<td>$5,256,751</td>
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<tr>
<td>Sioux Falls</td>
<td>Health Sciences Simulation Center</td>
<td>$10,593,842</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>$74,500,000</strong></td>
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</table>

What is the Financial Structure of This Bonding Request?

The funds needed to provide $74.5 million for science facility and laboratory upgrades may be bonded through the South Dakota Building Authority for 25 years, with the state appropriating the necessary dollars to pay the annual lease payments. Based on an interest rate of 4.5 percent and a 3 percent administration fee from the Building Authority, the estimated annual lease payment is $5,174,934.

For more information, contact Janelle Toman at (605) 773-3455 or send e-mail to janellet@sdbor.edu.
Science Research Building

Square Footage: 26,928  
Estimated Cost: $8,078,400

Why is this project important?
1. **Dramatic increase in science enrollment** - During the past 15 years the number of students pursuing degrees in the sciences has increased 310%. BHSU science majors have a high acceptance rate into doctoral programs as well as medical, dentistry, pharmacy or health related degrees. A high percentage of BHSU students remain in state to pursue their careers.

2. **Increase in external grants** - Through aggressive efforts of the science faculty, external grants have increased tenfold ($519,046 to $5,191,546) during the past decade including grants funds NSF, NIH, EPA, National Oceanic and Atmospheric Administration, U.S. Department of Agriculture, and U.S. Fish and Wildlife Service.

3. **Increase in research** - Faculty in the sciences are contributing to research conducted at SUSEL; plant response to drought; DNA sequencing (only equipment of this type in the state) for genomic analysis to control invasive plants; genetic analysis of Native bison, South Dakota fish, resistance to mad cow disease, and other research projects important to South Dakota’s economy.

4. **Undergraduate research** - Nearly all science students participate in undergraduate research with a faculty mentor. In fact, BHSU had the second highest number of students among all universities presenting at the national undergraduate research conference in San Francisco this year.

5. **Critical need** - The above factors contribute to overcrowded and outdated lab facilities. While faculty have been successful in procuring equipment through grant sources, the labs and other research space have not been upgraded to accommodate increased enrollment and the growing demand for power and adequate ventilation.

What needs will this project fulfill? The new facility will provide the physical resources necessary for BHSU to prepare students in the sciences. This building will address both instructional and research laboratory space needs for undergraduate and graduate students. Approximately 900 BHSU students annually will benefit from this space including graduate students enrolled in the state’s only Integrative Genomics master’s degree. The space will also support growth in the health fields, fill a critical need for additional science teachers, and create enhanced opportunities to collaborate with SUSEL scientists in the areas of microbiology, genomics, and chemistry.

Why is this project unique? BHSU’s location, with its rich biodiversity and unique biogeography, near the rangelands of western South Dakota, the Black Hills, and the Deep Underground Lab present unique opportunities for research that will benefit South Dakota. No additional space has been built to accommodate our phenomenal growth. BHSU’s facilities are at capacity and future growth in external funding and research are in jeopardy.
Habeger Science Center Renovations

Square Footage: 35,708 GSF
Estimated Cost: $6,038,670

Why is this project important? The proposed project would provide a complete renovation of the Habeger Science Center, the primary science facility at Dakota State University. The one-story brick building was constructed in 1972 for $1,070,000 and has never been upgraded or renovated. The building includes 5 classrooms, a 200-seat lecture hall, 6 teaching labs (chemistry, biology, microbiology and physics) and a greenhouse/herbarium. The renovation is needed to provide space for faculty research and to upgrade and expand teaching labs, particularly for scientific forensic technology, advanced physics and biology. Currently, there is no building space set aside for faculty research and no teaching laboratory space set aside for scientific forensic technology and advanced physics.

What needs will this project fulfill? The renovation is critical for three reasons: safety, recruitment and retention of students, and support for new research initiatives. The building does not provide adequate teaching or research space to support the institution’s technology-intensive science programs. The renovation is also specifically intended to provide additional space for teaching and research in scientific forensic technology and in theoretical physics (neutrino research).

Virtually all DSU students will benefit from the renovated facilities, since an up-to-date science education should be part of every student’s general education experience. However, the renovation will have the greatest impact on students majoring in the sciences, since the current teaching lab facilities have not been upgraded since the building was built in 1972.

These renovated facilities will also aid recruitment and retention of science majors. In the last year, the university has developed a targeted recruitment and retention program, focused primarily on women in science and technology (WIST program), and these renovations will complement those activities.

Why is this project unique? Science has changed in the past 30 years, and the configuration of modern science labs is significantly different from the configuration of science labs built 30 years ago. Because of DSU’s unique technology mission, its science laboratories need to support and incorporate its mission-driven, information technology focus.
NORTHERN STATE UNIVERSITY
SCIENCE FACILITY RENOVATIONS

• Square Footage: 11,122
• Estimated Cost: $2,701,900

Why is this project important? Northern State University currently offers 28 science lab courses in Biology, Chemistry, Geography/Geology, and Forensic Science. Approximately 665 undergraduate students take these lab courses every year and all of Northern’s existing science labs do dual—and often triple—duty as teaching and research labs for multiple classes. In order to alleviate this situation NSU seeks to renovate three existing spaces into specialized teaching and research labs in Biochemistry, Cell and Molecular Biology, and the Geoscience. NSU also seeks to construct a new science classroom in Administration Hall and to upgrade two chemical storage areas, a large science classroom, and another six science labs in Mewaldt-Jensen Hall.

What needs would this project fulfill? Enrollments in our Biology, Pre-Professional Health Sciences, and Forensic Science programs are growing and the increasingly sophisticated and technological demands of quality science teaching necessitate additional dedicated laboratory and teaching space. Since 2003, enrollments in our Chemistry/Forensic Sciences program have tripled and we added a new Geography Minor in 2006. Creating more specialized teaching and research labs will allow the university to teach more students per lab and to install additional specialized equipment. This action, will in turn, accommodate the increase in student interest and need. All students will benefit, especially those enrolled in our Science Education programs. Lab safety will also improve for all students and faculty.

About Northern State University
Northern State University is a premier residential institution characterized by outstanding instruction, extraordinary community relations, and unparalleled extracurricular opportunities. In August of 2007 NSU was named by US News and World Report as one of the best undergraduate public institutions in the Midwest. For more information about NSU, visit our Web site at www.northern.edu.
Paleontology Center

• **Square Footage:** 33,000  
• **Estimated Cost:** $7,063,963

• **Why is this project important?** Paleontology at the School of Mines has been an integral part of the university for more than 100 years. Currently the Museum of Geology houses approximately 300,000 fossil specimens, one of the largest collections in the United States and some of the best scientifically documented in the world. The collections support education and research for the university’s faculty and students and researchers from around the world. The university offers the only master’s degree in paleontology and enrollment continues to grow. The collections are currently housed in a building that leaves them vulnerable to decomposition, susceptible to loss from fire, and largely inaccessible for study. Sophisticated storage systems with costs in excess of $1 million are being provided from private sources.

• **What needs will this project fulfill?** The Paleontology Center will provide a safe, environmentally-controlled environment for the Museum of Geology’s fossil, geological, and archival collections, assuring the protection of this rich heritage. In addition, the Center will house laboratories for the preparation, preservation, and geochemical research involving the collections. The Center will provide a state-of-the art educational environment for faculty and students who will use the collections as a resource library to study the past to help answer current questions such as effects of climate change, overpopulation, invasive species, and more.

• **Why is this project unique?** The Center will provide academic researchers with access to study a world class collection, serve as an educational resource for training undergraduate and graduate students, and be a tool for outreach to the local and regional communities served by the university. A key feature of the Center will be open viewing into the laboratories so the public can learn the steps needed to take a fossil from the ground to a museum exhibit. In this capacity the Center will serve as an educational resource for graduate, undergraduate, and K-12 students and their teachers.
Chemical and Biological Engineering/Chemistry Building

• Square Footage: 49,250
• Estimated Cost: $17,957,700 ($10,000,000 of total from HEFF funds)

• Why is this project important? As a university with primarily engineering and science majors, all of SDSM&T’s 2,070 students will take classes and labs in this building. It is important that the university provide a safe teaching and learning environment for faculty and students. Many laboratories were built during the country’s first push to science and technology in the late 1950s and early 1960s. The ensuing years have left many of these science facilities in poor condition and beyond renovation or repair. To properly grow research in our state, improving the quality of science facilities and labs must be a priority.

• What needs will this project fulfill? The new building, when fully completed, will replace a fifty year old facility that has outlived its purpose for academic laboratory instruction. It incorporates state-of-the art graduate and undergraduate research space. The layout of the laboratories provides for innovative ways to conduct collaborative and multi-disciplinary research. This building will have modern laboratory space that will serve as the vehicle for conducting research for the enhancement of undergraduate and graduate education while affording the potential for economic development for the state of South Dakota. This new facility will facilitate the growth of rapidly-emerging technologies, such as ethanol, fuel production, food and agricultural processing, and environmentally-friendly plastics and coatings. Equally important is that the building be a campus showpiece that will aid in the recruitment and retention of students and faculty.

• Why is this project unique? Science and engineering buildings are different than other academic buildings in that they are planned from the inside out, at the kind of detail level where inches in the lab matter. For the millenial student, technology is expected, access to information immediate, and learning is “hands-on.” There is the need to work in teams, meet as groups, and jointly work with faculty. These factors are each integrated into the program, and are carefully balanced with the budget and square footage considerations.
Agricultural Hall Basement and Third Floor Renovations

Square Footage: 28,159
Estimated Cost: $8,006,275

Why is this project important? Ag Hall is a primary laboratory, class lab, classroom and office building on the campus of SDSU. It houses the College of Agriculture and Biological Sciences, including the Biology/Microbiology Department, the statewide Cooperative Extension Service offices, Agricultural Experiment Station offices and the Oak Lake Field Station administrative offices. To fulfill academic requirements, more than 50 percent of the undergraduate students at SDSU will take courses that are only taught in this building. The building was constructed in 1953 and has remained largely unmodified since that time. In addition to the pressing need to modernize the teaching, learning and research spaces, the greatest deficiency in the building is the basic infrastructure.

What needs will this project fulfill? The infrastructure upgrades, lab remodels, and the mechanical system upgrades will significantly improve the ability of the building to support the activities of its occupants. Of the two floors that will be renovated, 62 percent of the basement is used for research labs and associated support and 65 percent of the third floor is used for research, class labs and associated support. Necessary life-safety upgrades can be met through upgrades to the fire alarm system and improved laboratory ventilation. Accessibility standards can be met with upgrades to the building entrances and the elevator. Infrastructure improvements will provide services and systems to better control the environments in which collections and research is stored and studied. Energy savings can be realized through lighting upgrades, window replacements and centralized air conditioning.

Why is this project unique? Due to the nature and extent of the courses, research and services that are provided in this building, it is becoming increasingly important to assure that this facility and its infrastructure can support the needs of the university and the region. The faculty and researchers will be directly impacted in their efforts to provide instruction, ecology research, environmental research, wildlife habitat maintenance, and investigate the many ways humans interact and affect the environment locally and regionally. These upgrades and renovations will also indirectly serve regional agricultural producers and other public groups through the improvements to the State Soils Testing Lab.
Dairy Microbiology - Building Renovation

Square Footage: 41,868  
Estimated Cost: $8,259,250

Why is this project important? The Dairy Microbiology building houses the Dairy Science Department, numerous research and teaching laboratories and the State Dairy Laboratory. This building was constructed in 1962 and, except for basic maintenance and repair, has not had any major renovations to modernize the facility since that time. Building infrastructure and finishes are showing the effects of 46 years of use. The water piping, which is 20 years beyond its normal life expectancy, is galvanized piping and is corroded and leaking. The electrical system is at recommended capacity; as a result, SDSU is unable to accommodate large acquisitions of laboratory equipment due to the limitations with the service.

What needs will this project fulfill? This renovation project will address the critical systems, infrastructure and life safety upgrade that are needed to ensure that this facility can support the activities of its occupants. Necessary life-safety standards can be met through the installation of a fire sprinkler system, upgrades to the fire detection system and the removal of remaining nonfriable asbestos containing material. The additional mechanical space and its systems will help meet required ventilation rates and allow the building to be centrally air conditioned. Energy savings can be realized through heat recovery systems, lighting upgrades and window replacements.

Why is this project unique? The Dairy Science Department at SDSU offers not only an undergraduate, but also graduate (M.S. & Ph.D.) degrees in both dairy production and dairy manufacturing. The Dairy Microbiology building houses the class labs and research labs for these programs. Because SDSU is one of only two universities in the nation that offer both of these programs, it is critical that the university provide modern environments in which to learn and conduct research. In addition to the academic element, the State Dairy Laboratory is also located in the Dairy Microbiology building. This Laboratory provides services to the entire state by testing dairy products to assure they meet state quality standards.
Arthur M. Pardee Laboratory Renovation

• **Square Footage:** 16,905  
• **Estimated Cost:** $3,792,104

• **Why is this project important?** The Pardee Laboratory building is home for most of the Department of Chemistry operations. Chemistry is an important part of USD’s education and research mission. Students focusing on Bachelor of Science degrees take chemistry as part of the program. Health profession majors take a considerable number of chemistry courses. When Pardee was originally constructed, Chemistry did not have a doctoral program. Today, Chemistry offers a Materials Chemistry PhD. The research and classroom laboratories have not been renovated and hinder the department’s ability to conduct research and teach students. Completing the renovation of Pardee will provide modern research facilities in support of the expanded research activities and the new doctoral program. Additional research provides opportunities for students and faculty and strengthens the State’s economy.

• **What needs will this project fulfill?** Pardee is home to most of the teaching laboratories where USD students including future medical and other health profession students receive their chemistry instruction. The current condition of the labs is both a recruitment and retention issue for students and faculty. The project will address critical laboratory deficiencies including air circulation and exhaust systems (fume hoods), updating electrical and plumbing systems, and renovating research and classroom labs to meet the needs of faculty and students. Improving the facility to contemporary laboratory building standards will improve student and faculty working conditions, increase recruitment and retention, and enable the University to fulfill its strategic mission of educating future scientists, teachers and health care professionals as well as increasing the level of research and helping to drive the South Dakota economy.

• **Why is this project unique?** The Arthur M. Pardee Laboratory building was built in 1914. The construction is solid and has a strong Neo-Classical architectural style. Pardee houses research and teaching labs for the Department of Chemistry including the Governor’s 2010 Center for Research and Development of Light-Activated Materials and the labs for the Materials Chemistry program which was recently approved for a PhD. Renovating this building will allow Pardee to continue to serve USD students and faculty as they strive to fulfill the University’s mission and drive the State’s economy.
Churchill Haines Laboratory Renovation

• **Square Footage:** 26,221
• **Estimated Cost:** $6,751,145

• **Why is this project important?** The Churchill-Haines Laboratory building was built in 1977 and houses all the research and classroom laboratories for the Departments of Biology and a portion of the laboratories for the Department of Chemistry. The building was designed at a time when the primary mission of the university was teaching. The university has responded to the state’s emphasis on competitive research with a significant growth in the research program and doctoral programs. Both Biology and Chemistry now have doctoral programs and Biology is exploring a new doctoral degree in evolutionary ecology and genomics. The facility was not designed to handle the level or size of the research or doctoral programs and does not meet contemporary research standards since research has become more complex and utilizes more sophisticated equipment than when the building was built. The renovation of a space in Churchill-Haines will improve research and classroom laboratories to contemporary laboratory standards and provide needed space for graduate students and post-doctoral researchers. It will allow the Departments of Biology and Chemistry to meet the State’s goals of increasing research while also providing contemporary lab space for teaching students.

• **What needs will this project fulfill?** Churchill-Haines is home to the teaching laboratories where USD students including future medical and other health profession students receive all of their biology and a portion of their chemistry instruction. The laboratories have not had a major renovation and need to serve a larger and more complex research mission. As the research activities have increased, so has the sophistication of the equipment needed for conducting research. This project will address critical laboratory deficiencies including air circulation and exhaust systems (fume hoods), updating electrical and plumbing systems, and renovating research and classroom labs to meet the needs of faculty and students. Improving the facility to contemporary laboratory building standards will improve student and faculty working conditions, increase recruitment and retention, and enable the University to fulfill its strategic mission of educating future scientists, teachers and health care professionals as well as increasing the level of research and helping to drive the South Dakota economy.

• **Why is this project unique?** Biology and chemistry are important components of the University’s education and research responsibilities. Virtually all science students at USD will use Churchill-Haines at some point. The Departments of Biology and Chemistry are successfully responding to the State’s emphasis on research and doctoral programs. Churchill-Haines houses their research laboratories. It also houses the classroom laboratories where USD students including future science teachers, scientists and medical and other health profession students receive their biology and a portion of their chemistry instruction. The renovation project will address critical facility issues and bring a portion of the facility to contemporary laboratory standards.
Akeley Lawrence Science Center Renovation

• **Square Footage:** 24,667
• **Estimated Cost:** $5,256,751

• **Why is this project important?** The Akeley Lawrence Science Center was built in 1962 and is home to the Department of Earth Science and Physics and also one Chemistry teaching laboratory. The building was designed at a time when the primary mission of the university was teaching and few research activities were carried out on campus. The University is responding to the State’s goal to increase research and is positioning itself to be part of the research at the DUSEL laboratory. This will include attracting faculty to our campus and providing them contemporary facilities for research and teaching. The renovation of Akeley Lawrence will allow the University to attract and retain faculty and students, and to continue to expand research and to develop more scientists and science teachers for South Dakota.

• **What needs will this project fulfill?** The current condition of the labs is both a recruitment and retention issue for students and faculty and impedes the ability of the faculty to meet University and State goals. The project will address critical laboratory deficiencies including air circulation and climate control systems, updating electrical and plumbing systems, and renovating research and classroom labs to meet the needs of faculty and students. Improving the facility to contemporary laboratory building standards will improve student and faculty working conditions, increase recruitment and retention, and enable the University to fulfill its strategic mission of educating future scientist and teachers as well as increasing the level of research and helping to drive the South Dakota economy.

• **Why is this project unique?** Akeley Lawrence shares the same namesake as one of USD’s partners in the DUSEL project – the Lawrence Berkeley National Laboratory at the University of California-Berkeley. E.O. Lawrence grew up in Canton, SD and received a degree in chemistry from USD. He went on to establish the National Laboratory at UC-Berkeley and was the recipient of the Nobel Prize in Physics in 1939. This project will provide appropriate space for scientists seeking to advance the Deep Underground Science and Engineering Lab (DUSEL). The University is pursuing expansion of its physics program by strengthening its undergraduate program, through the addition of a Ph.D, and through partnerships with Lawrence Berkeley National Laboratory and Los Alamos National Laboratory. Renovating Akeley Lawrence will help to fulfill the State’s DUSEL research agenda, provide more physics teachers to the State, and enhances the tribute paid to one of the State’s most successful individuals – E. O. Lawrence.
Health Sciences Simulation Center

- **Square Footage:** 31,835
- **Estimated Cost:** $10,593,842

**Why is this project important?** This new space would provide space for all types of SDSU, USD and DSU health science students on simulators, standardized patients, and task trainers. Higher quality simulation equipment is now more readily available for Health Science students. Simulation experiences are needed for students from nursing, medicine, respiratory care, physician assistants, physical therapy, occupational therapy, health promotion and other disciplines to gain “hands-on” knowledge prior to coming in contact with “real” patients in the clinical setting. Ideally, the simulation center would be uniquely designed as a patient care setting with the various simulation models in a “typical hospital setting.” This setting would provide opportunities for a variety of case scenarios on the simulation models that students may or may not experience in student clinical rotations. There are patient exam rooms, various types of procedure rooms (surgery, delivery, ICU), a waiting room area for patients, rooms for students and staff to debrief after an experience/encounter. Everything is audio and video recorded for the later debriefing/learning session. The facility might use real, standardized patients or might use some type of mechanical or robotic manikin or part thereof. The manikins range from simple to very sophisticated in what they can do, talk, react to treatment or intervention, whatever. The partial manikins might be used for practicing procedures, like endoscopy or suturing. Low end manikins have been used in on-campus laboratories for a long time, however, the “reality” of true clinical case scenarios is currently lacking.

Included as part of the Simulation Center, this request would create two new science labs for the University Center to support the delivery of upper division courses likely leading to baccalaureate degrees in sciences such as biology, chemistry or a composite major. We would integrate these labs into the Simulation Center project and plan for the expansion of science labs in the future.

**What needs will this project fulfill?** There will be an increasing demand for health care professionals as the population of South Dakota ages, as new technologies in the medical field require further specialization, and as the health care delivery sector of South Dakota grows. Each health science student who spends time in a Simulation Center will be able to gain skill mastery for interventions of a variety of case scenarios, i.e., how to appropriately respond when a “simulated patient” experiences an electrolyte imbalance, or a drug reaction, or goes into insulin shock. The case scenario can be replayed in a “simulated patient” more than once so that students can safely learn from their mistakes. Every year, despite the heroic efforts of health-care professionals, more than 100,000 patients die nationally as a result of medical error. Using patient simulation in health care education will help reduce medical errors.

The University Center cannot deliver a science based major because we do not have the science lab facilities to support a major. Also, it was not appropriate, after consultation with campus experts, to include such labs in the new classroom building. Even though we do not deliver any science majors today, the need for a science major is evidenced in many ways. First, major economic development activities underway in Sioux Falls focus on the application of science more than ever before. This includes the recent announcements from Sanford Health, continued expansion by Avera Health and the prospect of expanded research on the University Center property.

**Why is this project unique?** The Simulation Center would provide a unique setting with advanced equipment and highly skilled faculty members who would guide the critical thinking of each student in a variety of simulated clinical experiences which would enhance their clinical judgment skills. Research supports the basis that students learn and retain information when they are actively involved in the learning process. A simulation center that is large enough to accommodate a variety of health science students will promote inter-professional learning as students and enhanced collaboration as graduates.