DAKOTA STATE UNIVERSITY

COLLEGE OF BUSINESS AND INFORMATION SYSTEMS

MS IN ANALYTICS PROGRAM AT DSU

SELF-STUDY DOCUMENT

External Reviewer: Dr. Rajeev Bukralia

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PART 1: INSTITUTIONAL HISTORY

Heritage: 1881 to 1982

Dakota State University was established in 1881 as the first teacher education institution in Dakota Territory. Teacher education remained the primary mission of the institution through the 1950s. However, in response to the changing needs of South Dakota in the 1960s, the university began to expand its role to include degree programs in the liberal arts and business.

In 1980, South Dakota welcomed a major new industry into the state: the banking and credit card industry. The success and growth of this new industry, as well as the success of other information-oriented, computer-based industries in the state, prompted the state's leadership to carefully examine the degree programs being offered at the public institutions of higher education within the state. After lengthy discussions, leaders in state government, the banking and information services industries, and the Board of Regents agreed to develop new degree programs at one institution and then to use the experience and knowledge from this development to expand programs throughout the state's public higher education system.

Mission Change: 1983 to 1984

In 1984, the Legislature of the State of South Dakota (South Dakota Codified Law 13-59- 2.2) assigned Dakota State University the role and mission of developing technology- based degree programs in information systems, business, teacher education, and allied health care services at both the undergraduate and graduate levels.

The Legislature provided $2.6 million in additional operating funds to support a three- year mission change at DSU. During the initial phase of the transition, the academic programs of the institution were reviewed. Degree programs were phased out if they were duplicated at the other five regental institutions or if graduates would enter an over- supplied marketplace. New information systems programs, computer equipment, and facilities were approved for DSU. During the transition, special attention was given to ensure that all students in programs slated for phase-out received a full opportunity to complete those programs. To ensure the continuation of education quality, when the number of students continuing in a program became very small, a special faculty- mentoring program was developed.

The second phase of the transition began in August 1984, with the development of degree programs that integrated computers and information technologies into traditional academic subjects and added coursework specific to the computer and information systems areas. Existing faculty were retrained, and new faculty were hired. Programs to implement the research and service aspects of the new role and mission were started. This was a period of stress for the campus, but it was also a period of great exhilaration with faculty and staff invigorated and renewed by the need for innovation, adaptation, and change. Some faculty and staff were unable to adapt to the changing conditions and left the university, but those who stayed on for the ride were justly proud of their accomplishments.

Realizing that the innovative programs being developed at DSU were expensive, private industry and state government provided the university with additional financial resources. Consultants from state agencies and from national corporations also provided assistance and guidance that contributed greatly to the success of the mission change. Amplifying the Mission Change: 1984 to Present

In 2015, as part of the launch of DSU's 2020 Strategic Plan, "Excellence through Innovation", DSU leadership and employees reaffirmed the Institutional Mission, Vision, and Values.

Mission

> *DSU provides learning that integrates technology and innovation to develop graduates ready to contribute to local, national, and global prosperity.*

Vision

> Building upon its distinctive mission, DSU will become:

> 1. The university of choice for those seeking a student-centered institution that offers innovative programs grounded in teaching, research, technology, scholarship, and service excellence.
> 2. An academic community that serves as an economic engine in local, national, and global markets.
> 3. A campus recognized for its achievements in continuous quality improvement.

Values

- Student success.
- University-wide Excellence.
- Distinction in Teaching, Scholarship, and Service.
- Academic Freedom and Integrity.
- Diversity, Respect, and Inclusion.
- Continuous Improvement.
- Community, Collaboration, and Communication.
- Technology and Innovation inside and outside the classroom.

As the institution endeavors to articulate its mission in the fullest way, our degree programs are scrutinized each year to ensure they remain on the cutting-edge relative to technology to enhance and support instruction and address work force demands. When new degree programs are proposed by the colleges, they must clearly satisfy the "Is it compatible with our mission?" question before any additional planning is done.

In 1998 DSU received authority from the South Dakota Board of regents to offer its first graduate program, A Master of Science degree in Information Systems. A year later the Master program in Educational Technology was offered on our campus. In 2004, DSU received

authorization for its first doctoral program, offered in Information Systems.   DSU now offers four doctoral degrees, seven master's degrees, and eight graduate certificates.

DSU Rising Initiative

In 2017, Dakota State University began a transformational five-year capital investment initiative called DSU Rising.

The initiative is the result of a $30M donation from philanthropists Miles and Lisa Beacom and Denny Sanford. The donation will allow for the construction of an $18M, 40,000-square-foot research and development building for the Madison Cyber Labs (MadLabs). The funds also provide for additional scholarships, new program development, hiring of more faculty and staff, and support the university's intent to bring 5G network capabilities to Madison, the region, state, and eventually the nation. In addition, South Dakota Governor Dennis Daugaard pledged $10M to Dakota State, monies from the research and development Future Fund. U.S. Senator Mike Rounds(R-SD) has pledged to help Dakota State earn $20M in federal funds to advance DSU's cyber mission.

Madison Cyber Labs

On Jan. 31, 2018, Governor Dennis Daugaard signed House Bill 1057 into legislation which permitted the demolition of DSU's Lowry Hall and construction of the Madison Cyber Labs, or MadLabs. The Madison Cyber Labs build on DSU's expanding capabilities and strengths to establish a hub of cybersecurity and cyber operations expertise, research, and economic development in South Dakota. As of February 2022, DSU faculty has established 16 MadLabs. Construction of $18-million, 40,000-square-foot MadLabs building, located on the southwestern edge of campus, was completed in Fall 2019. It is the first research facility of its kind in the Upper Great Plains region.

There are five components to MadLabs' game-changing plan to reshape the cyber field in South Dakota, including 1) Resources: A winning combination of laboratory research space, state-of-the-art hardware and software, faculty expertise, and growing institutional relationships with a wide variety of public and private agencies; 2) People: Undergraduate and graduate students, faculty, researchers, interns, and other collaborators; 3) Programs: Nationally recognized cyber degrees from the associate to doctoral level, along with other professional development opportunities; 4) Research areas and institutes: Focus areas in defined interdisciplinary and multidisciplinary regions, that draw from every college on campus; 5) REED Connection: DSU is connected to the South Dakota Research, Education, and Economic Development Network (REED) via a 100 Gbps connection. Providing the campus with connectivity to Internet2, the Great Plains Network, and other research networks.

Already known as a national leader for cyber security and having a mission focusing on technology and information technology, DSU earned a National Security Agency designation as

a Center for Academic Excellence in Cyber Operations in 2012. In 2017, The National Security Agency (NSA) and Department of Homeland Security (DHS) renewed the designation. The NSA designation comes with levels of responsibility to the Agency regarding Knowledge Units and student success.

DSU intends to put South Dakota on the leading edge of cyber-technologies with new economic development clusters creating high paying jobs and giving former students the ability to 'come home' to cutting-edge companies and a growing regional economy. In 2021, Dakota State university and Sanford Health of Sioux Falls, SD have announced a CyberHealth Strategic Alliance between the two organizations that will drive cyberhealth innovation and research and create workforce and economic development opportunities for South Dakota.

DSU Rising II

The DSU Rising II project (2022) created a funding consortium to provide $90 Million to fund new components to the cyber-research and education environment: a 100,000 sq.ft. facility to house the expanded DSU Applied Research Lab in Sioux Falls, S.D., the support required to double the DSU cyber graduates, authority to expand DSU-ARL Management and Security, to expand merit-based Student Scholarships in cyber education, and to launch the Governor's Cyber Academy (a statewide K-12 cyber education program).

Student Demographics

Prior to the mission change in 1984 and like most state funded institutions, the majority of DSU students lived within a 50-mile radius of the campus. Most were traditional students coming to the institution directly from high school. Since the mission change, the DSU audience and student population has changed markedly. Immediately after the mission change, enrollment plunged a frightening 27.6 percent the first year, followed by another 12.6 percent decline the second year. But the new curriculum changes, combined with new institutional vigor, provided the institution with unprecedented enrollment growth and stability. **Figure 1** shows the undergraduate, graduate, and total enrollment at DSU since Fall 2014. In the last years, DSU has reported steady overall enrollment, significantly better than was anticipated for a semester in the midst of the COVID pandemic crisis.
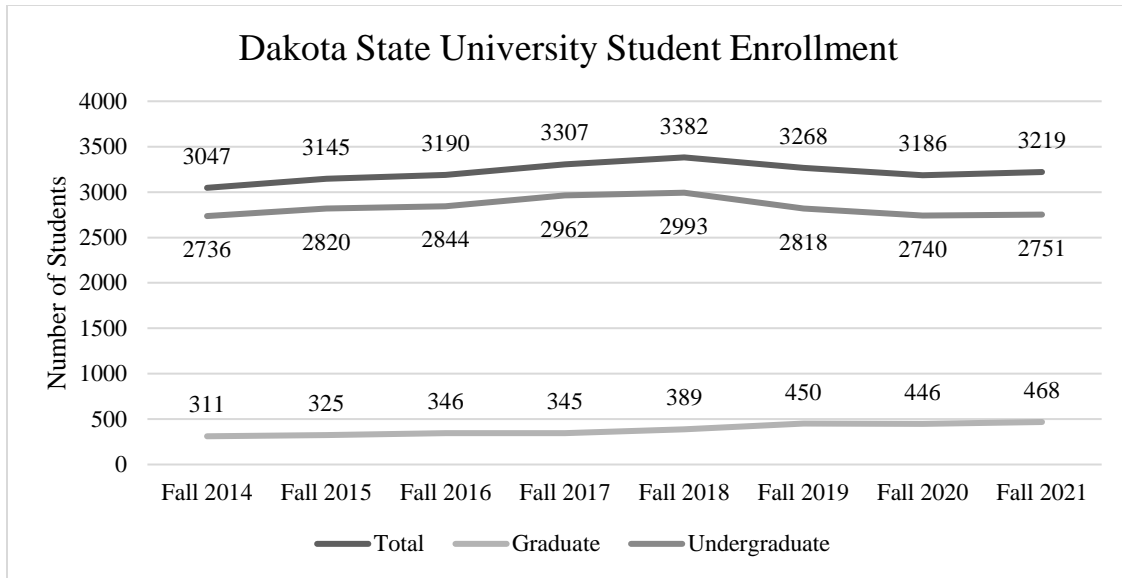
Dakota State University Student Enrollment

	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Fall 2019	Fall 2020	Fall 2021
Total	3047	3145	3190	3307	3382	3268	3186	3219
Undergraduate	2736	2820	2844	2962	2993	2818	2740	2751
Graduate	311	325	346	345	389	450	446	468

Y-axis: Number of Students (0 to 4000)

Figure 1. DSU Enrollment by Academic Level, Fall 2014 to Fall 2021

Computing Environment

Dakota State University students at DSU enjoy unique access to technology. DSU was not only the first institution in the region to provide 1:1 portable computing and a campus wide wireless network overlay, but one of the first in the nation to do so. In 2005 all students were provided fully functional portable computers (tablets) that included digital inking capabilities and voice to text translation. Currently, DSU are providing students with the latest Lenovo ThinkPad X1 Yoga, a 2-in-1 Laptop configured specifically for DSU academic programs. Similar computing tools allows for common computer imaging and software licenses used in classes. However, students may join the ubiquitous computing environment with devices of their own. Computing omnipresence builds on a long tradition of supporting data communication and networking innovations. For degree programs emphasizing information assurance and security issues as well as digital design, additional lab facilities featuring computers with high-end functions have been added to the campus technology infrastructure. DSU's leadership in using technology to support student learning also extends to the online environment when Liberal Arts Dean Eric Johnson delivered the first Internet-enabled course in 1989.

Throughout its 137 years, Dakota State University has had a proud heritage of preparing graduates to meet the needs of a changing society. Since 1881, the university has provided challenging academic programs in one of the best educational environments in the state. The continuation of this tradition of service is of prime importance to the faculty, students, staff, and administration of Dakota State University.

Accreditation History

Dakota State University was granted accreditation by the Higher Learning Commission for a period of ten years in 1961 and accreditation has been continued after each comprehensive visit. The institution's most recent comprehensive visit, in October 2018, resulted in a positive review without any requirement for monitoring reports. Currently, DSU is participating in the Higher Learning Commissions' Academic Quality Improvement Program (AQIP). Six AQIP Categories provide a framework for examination. The AQIP Categories are:

- Helping Students Learn
- Meeting Student and Other Key Stakeholder Needs
- Valuing Employees
- Knowledge Management and Resource Stewardship
- Planning and Leading
- Quality Overview

Each AQIP Category deals with a related group of key processes and encourages an organization to analyze, understand, and explore opportunities for improving these processes and the interrelationships among them.

The AQIP process works in tandem with our existing strategic planning and project review processes. It provides a framework that focuses on data analysis and the achievement of its published goals and objectives. The alternate accreditation review process is every ten years. With AQIP, our accreditation is reviewed yearly in cycles and culminates in a Reaffirmation of Accreditation at the end of a seven-year cycle.

About DSU's MS in Analytics Program

In April 2014, the South Dakota Board of Regents authorized Dakota State University to offer a Master of Science in Analytics degree. DSU's MS in Analytics (MSA) program and South Dakota State University (SDSU)'s MS in Data Science program were developed collaboratively to allow students at both institutions to take advantage of DSU's strengths in information systems, computer science, and health information technology, and SDSU's strengths in statistics and computational science. The two programs share the same core set of courses.

The first MSA students were admitted in the Fall of 2014. As a discipline, Analytics focuses on theory and practices related to using programs and computational tools to explore and discover relevant insights in big data. In business and industry, Analytics is being used to solve crucial data-driven issues and assist with analytic-driven decisions. Analytics as a discipline is relatively new. Growth and interest in analytics and data science is directly linked to the growth in and proliferation of analytics technologies such as machine learning, data visualization, Big Data systems, and Artificial Intelligence. Our MS in analytics program is a STEM program comprising coursework that helps equip students with a variety of analytics skills, including statistical analysis and machine learning with SAS, Python, and R, Big Data Analytics using Hadoop, Spark,

and Kafka, business intelligence and visualization using Tableau and PowerBI, deep learning with tensorflow, and more.

Courses in the MSA program has been offered using two major instructional delivery methods: 1) Face-to-face on site in Madison, SD in a traditional classroom setting; and 2) at a distance via Internet, using a combination of both live and/or encoded streaming videos of classes, course web sites, and e-mail. Among all students that have been enrolled in the MSA program, 28.12% were full-time students taking the program on site in Madison, SD, and 71.88% were online students.

PART 2: TRENDS IN THE DISCIPLINE

National and Regional Trends

Use of analytics continues to grow in business and industry, and along with that growth, there is a strong demand for individuals with advanced training in analytics. Glassdoor.com has ranked "Data Scientist" one of the top 3 jobs in America annually since 2016 (Glassdoor.com 2016-2022). It had about 1700 job postings with data science being the primary role in 2016. That number rose to 4500 in 2018 and 6500 in 2020. Demand for data scientists will continue into the foreseeable future. The U.S. Bureau of Labor Statistics sees strong growth for analytics and data science jobs skills in its prediction that the data science field will grow about 28% (roughly 11.5 million job openings) through 2026 (Forbes.com, 2021/6/10).

There is a substantial need for analytics professionals in South Dakota. The Master's level Analytics graduates are hired by many companies in South Dakota, as well as companies in the surrounding region and nationally. A partial list of South Dakota companies that currently hire Analytics graduates include: 3M, Avera McKennan Hospital, BrightPlanet, CAPITAL Services, Citibank, Cortrust Bank, Daktronics, EROS Data Center, Fishback Financial Corporation, Great Western Bank, Innovative Systems, Meta Payment Systems, Midland National Life, Premier Bankcard, Raven Industries, Reliamax, Sanford Research, Sencore, and Wells Fargo. Employment opportunities also exist in state government with the South Dakota Bureau of Information & Telecommunications, the South Dakota Department of Transportation, the Board of Regents Information Systems, and others.

New trends:
In recent years, Artificial Intelligence (AI) has grown significantly and become a substantial area of business investment. Increasingly, companies have been incorporating AI capabilities into their business processes and using AI to power many sophisticated predictive analytics solutions. According to a survey by Gartner (Gartner.com, 10/19/2020), by the end of 2024, 75% of enterprises will shift from piloting to operationalizing AI, driving a five-time increase in streaming data and analytics infrastructures.

Another new trend related to analytics is that nowadays, analytics is often done in the cloud. Gartner (2020) estimates that by 2022, public cloud services will be essential for 90% of data and analytics innovation. Also, we are witnessing the rapid development of new analytics-related technologies such as Blockchain that addresses two challenges in data and analytics. It provides 1) the full lineage of assets and transactions and 2) transparency for complex networks of participants, thus ushering in a variety of new analytics applications.

In summary, national and regional trends demonstrate the value and potential for MS in Analytics programs. Meanwhile, as technology improves, companies have been able to increase the sophistication of their data operations and analysis by using new technologies such as AI. While the development of these new technologies creates new demand for data scientists, it also entails modifications to our MSA program to keep up with the latest advances in industry.

Curriculum Implications

DSU's MSA program is cognizant to identify and leverage opportunities that proactively respond to national and regional trends. Some examples include:

1. We added INFS 756 Cloud Computing and Network Services, which is an elective course of MS in Information Systems, to our MSA program as an elective.
2. In view of the new AI trend, we added two AI-related courses including INFS 778 Deep Learning in 2020 and INFS 784 AI Applications in 2021 to the program. In 2021, we added a new track "Artificial Intelligence" that includes INFS 778 and INFS 784 to the program.
3. Our coursework has been focusing on statistical modeling and machine learning. After conversations with companies such as Capital Services – Sioux Falls, we recognized that there is a demand for business analysts with solid knowledge of business intelligence and visualization. We hence added a new course INFS 776 Business Intelligence and Visualization to our program in 2020.

Given the rapid changes in the discipline, the program continues to assess its curriculum with respect to the relevance of the existing courses and opportunities for new ones, and the relative emphasis on breadth (core) – depth (tracks), as well as the role of electives. We are currently developing an emphasis on AI. We will shift the focus of our program from more traditional statistical modeling to more cutting-edge AI-powered analytics. We plan to make the two AI courses INFS 778 and INFS 784 core courses of the program. We are collaborating with the Beacom College of Computer and Cyber Sciences at DSU and will add some AI-related courses newly offered by Beacon such as CSC 578 Generative Deep Learning and CSC 579 Reinforcement Learning to the AI track of the MSA program.

In the last few years, faculty workload constraints have limited us from developing new courses that teach new technologies such as AI and Blockchain. We expect the limitation to be resolved

as the College of Business and Information Systems at DSU are filling open faculty positions this year.

PART 3: ACADEMIC PROGRAMS AND CURRICULUM

Mission

The mission of the College of Business and Information Systems is to educate and prepare students to be life-long learners and professionals in business, information systems, analytics, and health information management. Inherent in the educational process is challenging individuals to develop analytics skills, to think logically, and to make sound decisions.

The MSA program at DSU will prepare graduates with the skill set necessary to transform them into analytics and data science professionals. These professionals are needed to solve crucial data-driven business problems and assist with analytics-driven decision making that is needed in the work force as the progression of big data jobs continues to grow.

Use of information technology (IT) and statistical analysis continues to grow in business and industry and, along with that growth, comes a need for individuals with advanced training. Graduates of the analytics program may find careers such as analytics professionals, data scientists, data architects, data governance specialists, predictive modelers, business intelligence/analytics developers, data visualization specialists, business analysts, market analysts, financial analysts, supply chain analysts, data analysts, computational scientists, or machine learning software engineers in technical, industrial, business, health care and financial companies of all sizes, as well as in the public sector.

Objectives

Upon graduation, graduates of the program will:
- be able to prepare and transfer big data sets into actionable information in an easy-to-understand format to support analytics through the use of advanced data processing tools.
- be able to select the appropriate analytics techniques and apply advanced analytical tools to solve data analytics problems.
- be able to demonstrate a good understanding of using information technology and computing languages to implement analytics solutions.
- be able to assess alternative approaches and infrastructures for implementing big data analytics.
- be able to manage data analytics projects to ensure delivery of a successful data analytics initiative throughout its life cycle.
- be able to interpret the results of the analysis.

Program Description and Requirements

The program can be completed on a full or part-time basis, with classes offered in three academic terms, fall, spring, and summer. Time to complete really depends upon the number of credit hours taken per semester and the number of knowledge requirements needed. Full-time students (30 credit hours over three semesters) can complete the program in a calendar year (assuming two knowledge support courses are required). The program must be completed within 5 years of the date the program is started (first course taken). The program requires 30 credit hours, and candidates for graduate must pass the MSA comprehensive exam to graduate. Table 1 summarizes the program requirements.

Table 1. **Summary of the degree**

M.S. in Analytics	Credit Hours	Percent
Six required core courses as specified (see Table 3)	18	60
The following two courses will be the required curriculum beyond the core courses in the MS in Analytics		
• INFS 768 P ADVANCED DATA MINING APPLICATIONS	3	10
• INFS 770 Advanced Data Mining Applications	3	10
Two elective courses in a Track. The tracks in the program include: Artificial Intelligence, Information Systems, Business, and Healthcare Analytics. Students may also opt for a General track which entails taking two elective from two different tracks. (see table 4)	6	20
All candidates for graduation must participate in an assessment activity. Students will be provided with specific information to MSA comprehensive exam during their final semester. The MSA students must complete the comprehensive exam to graduate.		

The knowledge requirements of the program include 1) Database design/programming including familiarity with SQL (INFS 760 or STAT 410/510); 2) Understanding of the principles of programming (INFS 605 or equivalent); and 3) Understanding of statistical principles. Students who do not meet knowledge requirements may be required to take up to 9 additional hours (see Table 2).

Table 2. **Knowledge Courses**

Prefix & Num	COURSE TITLE	Credit Hours
INFS 605	Foundations of Programming	3
INFS 608	Applied Statistics	3
INFS 760	Enterprise Modeling and Data Management	3

The six core courses are shown in Table 3. These courses are common core courses shared by DSU's MSA program and SDSU's MS in Data Science program. DSU offers the three INFS courses, and SDSU offers the three STAT courses.

Table 3. **Common Core Courses in the MSA program**

Prefix & Num	COURSE TITLE	Credit Hours
INFS 762	Data Warehousing and Data Mining	3
INFS 774	Big Data Analytics	3
INFS 772	Programming for Data Analytics	3
STAT 600	Statistical Programming	3
STAT 601	Modern Applied Statistics I	3
STAT 602	Modern Applied Statistics II	3
	Subtotal, core courses	18

Table 4 lists courses that may be taken as electives in the program. DSU MS in Analytics elective courses are divided into four tracks including "Information Systems", "Artificial Intelligence", "Healthcare Analytics" and "Business". DSU MSA students can specialize in one of the tracks and select two elective courses from the track. They may also opt for a "General" track, which entails taking two electives from two different tracks.

Table 4. **Tracks and Elective Courses**

DSU Prefix & Number	Course Title	Credit Hours
Information Systems Track:		
INFS 720	Systems Analysis and Design	3
INFS 724	Project and Change Management	3
INFS 730	Web Development	3
INFS 756	Cloud Computing and Network Services	3
INFS 764	Information Retrieval	3
INFS 766	Advanced Databases	3
INFS 776	Business Intelligence and Visualization	3
Artificial Intelligence Track:		
INFS 778	Deep Learning	3
INFS 784	AI Applications	3
Healthcare Analytics Track:		
HIMS 701	Introduction to Healthcare Information	3
HIMS 742	Healthcare Information Infrastructure	3
HIMS 743	Advanced Topics in Health Informatics and Health Information Management	3
HIMS 744	Healthcare Information Analysis	3

HIMS 746	Data Management in Health Informatics	3
Business Track:		
BADM 712	Advanced Business Finance	3
BADM 729	Business Analysis for Managerial Decisions	3
ECON 730	Economics for Decision Making	3
BADM 755	Organizational Behavior and Human Resources Management Process	3
BADM 775	Strategic Marketing	3
INFS 782	Marketing Analytics	3

Changes to MSA healthcare analytics track (effective in Fall 2022):

Students in the healthcare analytics track can take the following two courses that best fit the track.

- HIMS 701 Foundations in Healthcare Information
- HIMS 702 Foundations in Health Information Classification Systems

Students who already have US healthcare delivery knowledge or experience will be able to substitute HIMS 701 with HIMS 745 Legal and Ethical Aspects of Health Informatics 3 credits to gain an understanding of HIPAA requirements and ethics of working with healthcare data. HIMS 702 was added in 2019-20 as a new course. It provides the foundation that MSA professionals need to understand the basics of medical terminology, anatomy and physiology and disease processes encountered in healthcare settings. MSA students will be better prepared to understand and analyze the meaning of data in healthcare settings with a basic understanding of these topics. Students who have had undergraduate or graduate level courses in medical terminology, anatomy and physiology, and disease process will be able to substitute HIMS 702 with HIMS 750 Exploration of Population Health Data in Health Informatics.

Program Delivery

Courses in the MS in Analytics degree program are offered in both face-to-face and online classes. A number of instructional strategies which capitalize on the use of classroom-based and distributed technologies are used. Those approaches include seminar, labs, guided research and other interaction heavy components between instructor and students. Courses are supported with D2L courseware for virtual collaboration, assignment submission, and class discussion. Point-to-point and multi-user video platforms will support synchronous dissertation committee work. DSU has invested heavily in a virtualized infrastructure to allow for technical, hands-on experiences for students on campus and at a distance. This VMware environment has been instrumental in the online delivery of both undergraduate and graduate degrees. Educational experiences for students are greatly enhanced through these applied, hands-one technology-based activities. Accessibility standards are prioritized to offer students with special needs the best in barrier free learning.

Curriculum Management

The curriculum is overseen by working groups made up of faculty who teach classes in the degree program. Curriculum modifications are first proposed by faculty members at Information Systems Faculty meetings, which include both undergraduate and graduate faculty in Analytics and Information Systems. If new or modified curriculum is approved, it moves on for subsequent approvals before being implemented. For a curriculum proposal to be implemented, it needs to be approved in order by the committees listed below:

1. IS Faculty group
2. College of Business and Information Systems
3. Graduate Council
4. South Dakota Board of Regents

Fast Track (4+1) Graduate Program (BIS)

The Fast Track program at DSU provides a unique opportunity for high achieving undergraduate students to obtain both a Bachelor's and a Master's degree in five years. This is accomplished by allowing these students to take selected graduate courses during their senior year. These courses will also count towards their undergraduate course requirements thereby accelerating completion of a graduate program.

Computer Information Systems with MS Analytics Fast Track Program of Study

BS in CIS students will be allowed to take up to 9 graduate credits during their senior year. Substitute three specific INFS courses to replace three CIS courses.

- Take INFS 768 Predictive Analytics for Decision Making to replace: CIS 368 - Predictive Analytics
- Take INFS 772 Programming for Analytics to replace: CIS 372 - Programming for Analytics
- Take INFS 776 Business Intelligence and Visualization to replace: CIS 474 - Business Intelligence and Big Data

PART 4: PROGRAM ENROLLMENTS AND STUDENT PLACEMENT

Enrollments

Figure 2 shows the MSA enrollment since its inception. The enrollment of the MSA increased significantly in the first four years. Then it stabilized from Fall 2018 to Spring 2020. Affected by the Covid pandemic and increasing competition, the MSA enrollment has declined since Fall 2020. Currently, there are 41 students enrolled in the program.
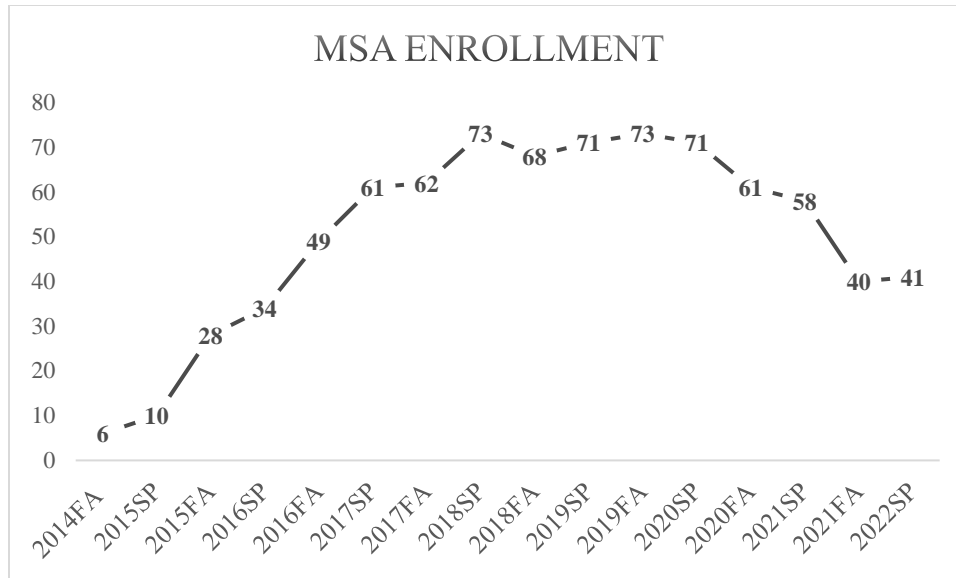
Figure 2. MSA Enrollment since Fall 2014

Placements

The MSA program has 100% placement rate since its inception. The average entry salary for those employed in 2020 was $81,810. In 2018-2020, 15.5% of the graduates were placed in South Dakota, 85.5% of them out of state. The following is a list of employers and positions for graduates in 2020:

ADP – Senior Cybersecurity Analyst, August, GA
BlueCats – Senior Research Associate, Huntsville, AL
Center for Health Workforce Studies – Public Health Specialist, Rensselaer, NY
Cloud Karma – Data Engineer, Houston, TX
Dell Technologies – Advisory Consultant, Round Rock, TX
Fiserv – Conversion Analyst, Sioux Falls, SD
Florida International University – Data Analyst, Miami, FL
Grant Street Group – Business Analyst, Pittsburg, PA
HealthITq – Director of Data Governance, Maitland, FL
K Force Inc – Data Analyst, Plano, TX
N.D. Department of Health – Data Analyst, Bismark, ND
National Indemnity Company – Data Analyst Programmer, Omaha, NE
Omnitech, Inc – Software Engineer, Sioux Falls, SD
T-Mobile – Sr. Systems Design & Strategy Engineer, Redmond, VA
U.S. Bank Corporation – Data Engineer, Minneapolis, MN
Verizon – Data Management, Hilliard, OH
Walt Disney World – Data Quality Assistant, Orlando, FL

PART 5: FACULTY CREDENTIALS

A list of the faculty who teach in the MSA programs at DSU and their credentials are included in Table 5. Current vitae for the faculty listed in Table 5 are included on the program review web site.

Table 5. Faculty Teaching in the MSA Program

Faculty Member	Rank	Academic Credentials
Bishop, David	Associate Professor	DSc
Brooks, Patti	Assistant Professor	DSc
Chang, Yen-ling	Associate Professor	PhD
El-Gayar, Omar	Professor	PhD
Krebsbach, Stephen	Professor	PhD
Liu, Jun	Associate Professor	PhD
Noteboom, Cherie	Associate Professor	PhD
Park, Insu	Associate Professor	PhD
Saunders, Chris	Professor	PhD
Shan, Ronghua	Professor	PhD
Spohn, Renae	Director of HIMS program	PhD
Talley, Daniel	Professor	PhD
Tech, Deb	Associate Professor	PhD
Wulf Plimpton, Julie	Assistant Professor	MS
Walters, Jack	Professor	PhD
Zeng, Qiang (David)	Assistant Professor	PhD

Graduate Faculty-Student Research

The expectation at DSU is to provide leadership in the areas of computer science, analytics, information systems, and cyber security. All DSU graduate students receive a strong introduction to research methodology, and the MSA program require up to 9 credits in statistical competence. Our MSA students immersed in faculty-mentored empirical research on a scale ranging from course level to conference/journal publications. Guest lectures, university forums, and research symposia are designed to help our students see the interdisciplinary nature of research. The Graduate Office funds nearly half of its on-campus graduate student population at regional and national conferences (pre-pandemic). Both online and on campus students can compete for Graduate Research Initiative (GRI) funding to support their research projects. No statement of our rising research expertise is more compelling than those of Chief Architect of Amazon Web Services, Mark Ryland who declared that research efforts at DSU will

help to "provide the core research in the cyber sector and help develop its' students' transferrable skills." (Beacom College Inauguration, 2017).

Competitions:

Our MSA students have actively participate analytics-related competitions. A group of our MSA students, advised by Dr. Jun Liu, participated in SAS Global Forum 2016 Student Symposium Machine Learning Competition, and they were selected as one of the top 8 teams in the competition and presented their project in the symposium. MSA students, led by Dr. David Zeng, have attended the SDSU Data Science Symposium Poster Competition every year since 2018. MSA students have won one first prize and one second prize in the competition.

MadLabs:

Developing MSA students with real-world analytics projects, to solve real-world problems, is one of the highlights for the MSA curriculum. Currently this effort is actively made by MSA faculty members under Dakota State University's Center for Business Analytics Research.

CBAR and its externally funded projects have become the excellent opportunities for our MSA students to build analytics skills in real world-facing contexts. Dr. David Zeng, director of CBAR, and one of the faculty members teaching MSA courses, noted that CBAR is building a workforce with the skills companies need. Through collaborations with CBAR, we could combine research projects and externally funded grants with the Master of Science in Analytics program. It also leads internships and real job opportunities for our full-time and on-campus students in the MSA program. During the current academic year (2020 -2021), about 70% of the full-time on-campus MSA students actively participate in CBAR projects.

Center for Advancement of Health Information Technology (CAHIT) is another MadLab that has closely collaborated with the MSA program. CAHIT helps medical practices of all sizes adopt electronic medical records and uses them to transform their medical practices. It also research health information technology, the Internet of Things (IoT) devices and their impact. CAHIT has provided MSA students with graduate assistantships and internship opportunities.

Faculty Workload

The current faculty workload document of Dakota State University was effective May 1, 2021 and will be reviewed at least once every three years.

FACULTY MEMBERS HOLDING PROFESSORIAL RANK

While the standard workload is 30 workload units per academic year, reasonable time is allocated to faculty members who hold professorial rank and who actively engage in research, scholarship, or creative artistic activity or who actively pursue professional service activities related to their disciplines. Ordinarily, reasonable allocated time is equivalent of six workload

units of instruction, or its equivalent per academic year and, if assigned, the faculty member must be actively engaged in productive scholarship. The institution may adjust this workload requirement to ensure faculty members have adequate time for research and scholarship or service or as deemed necessary by the institution and as specified below in this workload document. Tenured faculty members, with consent of the dean, may opt out of the requirement for scholarship/creative activities and, in lieu of research, increase the workload assigned to instruction or service. Upon mutual agreement with the dean, faculty members who are unable to perform expected service responsibilities may be assigned increased workload units for instruction. The typical full-time teaching load for tenured or tenure-track faculty is 24 semester credit hours for each academic year (fall and spring). Faculty whose teaching load exceeds that requirement (and who are actively engaged in research, scholarship or creative artistic activity and who actively pursue professional service activities related to their disciplines) may qualify for overload pay when the teaching load exceeds the 24-credit requirement in any given academic year. See Section III below for a discussion of overload compensation. Faculty holding professorial rank but located off-campus are required to provide service to the university, service to the discipline, and to actively engage in research, scholarship or creative artistic activity.

ACADEMIC ADVISING

Academic advising is recognized as part of a faculty member's teaching workload and generally will not exceed an assignment as primary adviser of more than 50 students for faculty members with professorial rank and more than 30 students for faculty members with lecturer rank. An unusually heavy advising load can be offset by a reduction in the faculty member's committee or other college assignments and/or a reduction in teaching load for faculty members holding lecturer rank.

Faculty Development

Center for Teaching and Learning (CTL)

In July 2018 Dakota State University established CTL to serve as the university hub of teaching support and innovation. Prior to the establishment of the CTL, a single university committee was charged with identifying instructional development topics and implementing faculty workshops/events. That committee is now an advisory group to the CTL, which is directed by a senior faculty (1/4 time) and includes an instructional design and technology specialist (full-time) and clerical support. The CTL is also assisted by four faculty associates (one from each college) who are among the university's most accomplished instructors with strengths in course development, learner engagement, and assessment. The CTL faculty associates provide mentoring and consultation with individual faculty as their time permits. This Center for Teaching and Learning identifies, coordinates, and provides professional and academic development activities for faculty and staff. The CTL works with academic administrators and faculty to identify instructional priorities and develop programming to address those priorities.

Faculty are also sampled to understand development emergent interests and needs. The CTL also joins with these and other institutional stakeholders to encourage an institutional culture that values and rewards teaching excellence. The CTL not only supports teaching and learning traditional classroom environments but is especially interested in providing pedagogical and technology development in online environments. This support has included the creation of instructional aids, materials, and media that are accessible online to assist faculty in improving their teaching and student interaction skills. The CTL has also initiated peer-review of all online courses using the state-mandated Quality Assurance (QA) rubric. For graduate students, the CTL provides expertise to support the goals of the university, including assisting in the production of quality thesis, dissertations, presentation, grant writing, and understanding of compliance issues. For undergraduates, engagement objectives include topics on mentored research, integrity (plagiarism, and copyright), and student service/government. Since Fall 2021, the following CTL faculty development events were offered:

Fall 2021:
- How to Use D2L
- TrojanConnect Training
- Using Floop to Provide Feedback
- Microlectures
- Integrating Human Rights Education info your Curriculum
- Instructional Strategies that Work

Spring 2022:
- Backward Design
- Microlectures and Microassessment
- Rubrics & D2L
- Technology Tools for the Classroom
- Reading & Vocabulary Strategies for College Students
- Book Club - Small Teaching Online: Applying Learning Science in Online Classes
- Book Club - Teaching Unprepared Students: Strategies for Promoting Success and Retention in Higher Education

Funds for faculty research and travel:

- DSU supports a Faculty Research Initiative (FRI) intended to encourage and facilitate faculty research and creative activity. Year 2021's competition offered up to $3,000 for individual faculty or up to $5,000 for collaborative teams.
- The Supporting Talent for Research Trajectories (START) program internal funding program was launched in 2018. This seed fund offers faculty support for preliminary work on research that will result in proposals for externally funded research grants.
- DSU also routinely sets aside significant funding for instructional and professional travel and for faculty training. Individual faculty can qualify for up to $1,200 for travel and training at qualifying events

PART 6: ACADEMIC AND FINANCIAL SUPPORT

College of BIS Support

The College of Business and Information Systems office is the central point of support for all undergraduate and graduate students with majors within this college. The central office is located in the Dean's office, which is located in the college building. The office is also provided with several work-study positions that are tasked with helping faculty whenever help is requested. **Table 6** lists the office staff of the College of Business and Information Systems.

Table 6. The College of Business and Information Systems office staff

Name	Title
Dorine Bennett	Dean of College of Business and Information Systems
Shannon Vostad	Administrative Assistant
Brenda Warren	Senior Secretary

Graduate Programs and Research Support Services

The Office of Graduate Studies was established to promote and support graduate education at DSU. The Dean of Graduate Studies collaborates with and supports the functions and responsibilities of the Graduate Council and the graduate program committees within each college and serves as the advocate for graduate education and graduate student support at DSU. The Office of Graduate Studies and Research staff is included in Table 7 below.

The day-to-day operations and services provided by the Office of Graduate Studies and Research are client-centered. The office offers guidance and help to students from the first inquiry to graduation. This includes providing accurate and timely program information and maintaining the graduate programs website with current information for degree-seeking students (http://www.dsu.edu/gradoffice/). The office also facilitates the recruitment of prospective students, the application process, assisting in setting up interactive audio-video for remote sites in South Dakota and online for distance students. Other services provided by the Office of Graduate Studies include assisting with course scheduling and course rotations; making students aware of changes in schedules, rotations, and graduate policies; assisting with registration; supporting the assistantship committees; monitoring student progress toward graduation; and serving as a liaison among other support staff, faculty, and administrators.

In July 1, 2018, the new role of Vice President of Research and Economic Development was developed at DSU. This position was created to address unprecedented growth in student numbers, employee numbers, academic programs, research activity, to further formalize the research processes campus-wide, and coordinate efforts between faculty and campus departments for increased efficiency. The university's awarded grant monies have been

increasing substantially since 2018. The award total increased $2,396,866 in 2018 to $6,493,257 in 2019 and $5,923,216 in 2020. With the CyberHealth Strategic Alliance with Sanford Heath and the $90 million initiative to expand DSU's Applied Research Lab, these numbers will likely continue to grow.

Table 7. **Graduate Studies and Research staff**

Name	Title
Ashley Podhradsky	Vice president for Research and Economic Development
Mark Hawkes	Dean of Graduate Studies and the Director of the Center for Teaching and Learning
Peter Hoesing	Director of Sponsored Programs, Research and Economic Development
Jennifer Mees	Program Assistant II
Erin Blankespoor	Administrative Assistant, Graduate Office
Nicky Khattapan	Instructional Design and Technology Specialist, Graduate Office

Library Resources and Services

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

Since Dakota State University received its current focused mission in the 1980's, the Mundt Library's mission has been to expand its collection of materials on computers, technology, and information systems. To that end, the Library has subscribed to an ever-widening number of databases and eBooks that support this emphasis. The physical and electronic collections continue to be built through faculty recommendations and requests, as well as from librarian selection based upon their knowledge of the curriculum and its needs. The journal collection is also based on faculty requests and is fine-tuned by means of an annual analysis of journal use. This analysis helps the Library focus its expenditures (and finite budget) on those journals that are regularly needed and used by the institution's students. The collections have been enriched with digital information. The Library subscribes to numerous online databases including the

Association for Computing Machinery (ACM) Digital Library, ProQuest Research Library, ABI-Inform, IEEE, Lexis-Nexis and over 100 others. Most of the material indexed in these databases includes direct access to the full text of the articles indexed. For those articles not available in full-text, the Library provides speedy interlibrary loan service at no extra cost to all DSU students, faculty, and staff.

The Library holds an extensive collection of electronic books on computer security and information assurance, which are discoverable via the library catalog. In addition, the Library subscribes to Safari Tech Books Online, which provides access to 150 titles that provide hands-on training in many areas of technology. The Library also provides access to LyndaCampus.com, which provides digital tutorials in almost every area of technology, marketing, education, and career planning.

The Karl E. Mundt Library is a member of several library consortiums and maintain borrowing and lending agreements with academic libraries across the country and around the world. As such, the Library can attain materials in digital and/or physical formats for any scholarly need.

In addition to the collections, systems and services offered, Library staff also provide assistance and instruction to faculty and students through workshops, classroom instruction, online tutorials, and one-to-one assistance and training. Library faculty collaborates with course faculty to ensure students have the research background necessary to complete course assignments.

Library faculty develops tutorials, subject guides, and other instructional materials to support classroom learning on campus and online. It is also the library's goal to graduate students who are able to find, evaluate, and use information to solve problems and to make decisions effectively. Graduates should have the knowledge and skills to function successfully as continuous learners in a continuously changing information world. To successfully meet its goals, the Library provides excellent collections, information systems, services, instruction, and staff. The professional library staff is included in **Table 8** below.

Table 8. Professional Library Staff

Name	Title
Jan Enright	Director of the Karl E. Mundt Library
Ryan Burdge	Archivist
Mary Francis	Associate Professor / Reference & Instruction Librarian
Michaela Clark	Library Associate -- Circulation & Interlibrary Loan
Ellen Hoff	Technical Services Librarian

Online@DSU Support Services

The Office of Online Education is responsible for program planning, marketing, program implementation and overall management of courses and programs offered by alternative delivery at Dakota State University. Working in partnership with the colleges and the institution's academic support areas, the Office of Online Education works to design and develop active and collaborative degree programs at a distance.

The Office of Online Education is staffed with the Director of Online Education, the State Authorization Coordinator, and an online admissions specialist shown **Table 9** below. This team serves the needs of students who are enrolled in the online and videoconferencing courses at DSU. The office is the mainstay of distance services to students, working with the administrative offices of DSU to provide these services. The staff also serves the Web needs of faculty, staff and students at DSU. The office staff assists faculty in the design and implementation of courses delivered by various forms of technology.

Table 9. Office of Online Education staff

Name	Title
Annette Miller	State Authorization Coordinator
Sarah Rasmussen	Director of Online Education
Andrea Derynck	Online Admissions Specialist

Information Technology Services Staff

DSU has a comprehensive technology infrastructure supporting universal (on and off campus) access to computing resources. The Information Technology Services staff listed in **Table 10** below provides technology support to faculty, staff, and students.

Table 10. Lead Information Technology Services support staff

Name	Title
Brent Van Aartsen	Chief Technology Officer
Stephanie Baatz	Director of Support Services
Lora Ersland	Director of Administrative Services
Craig Miller	Technology Procurement & User Support
Eric Holm	System Administrator
Tyler Steele	Manager of Multimedia Services

Administrative Support Staff

Current administrative staff will provide the academic support services to deliver academic programs at DSU. The administrative support personnel who are particularly critical to the delivery of the graduate programs are included in **Table 11** below.

Table 11. Administrative Support Staff

Name	Title
Corey Braskamp	Director of Facilities Management
Kathy Callies	Registrar
Amy Crissinger	Vice President for Student Affairs and Enrollment Management
Amy Dockendorf	Controller
Denise Grayson	Director of Financial Aid
Sara Hare	Director of Budget & Grants Administration
Peter Hoesing	Director of Sponsored Programs
Kelli Koepsell	Director of Marketing and Communication
Javier Lopez	Food Service Manager
Jeanette McGreevy	Director of Institutional Effectiveness and Assessment
Laura Osborn	Director of Institutional Research
Deb Roach	Director of Career and Professional Development
Donna Fawbush	Events Coordinator/Interim Bookstore Director
Nicole Claussen	Director of International Programs
Susan Slaughter	Program Assistant II

Academic Advising

Graduate students in the MSA program are required to work with their advisors to complete a Plan of Study within their first semester in the program. Information regarding advising, program rules and requirements, rotations, knowledge courses, and expected milestones are provided through the online materials posted on the Graduate Office website and in the Graduate Catalog. Program faculty members are assigned as the advisors for students in the MSA program.

Financial Support to the Students

Financial aid opportunities are expected to come from institutional and private sources. Financial aid policies and procedures for application, award, and distribution have already been developed to support the graduate programs at DSU. DSU has also certified alternative loan

eligibility for enrolled graduate students (based on their educational costs) to regional and national lenders.

PART 7: FACILITIES AND EQUIPMENT

With DSU's 1:1 portable computing environment requiring students to have a Windows or Mac laptop and its expansive secure wireless network, the need for dedicated computer labs is not as prevalent as it has been in the past. Classroom space on campus was significantly increased with the Fall 2017 opening of the Beacom College of Computer and Cyber Sciences, the first LEED version 4 building in South Dakota, and the renovations of East Hall in 2019 and 2021. Dedicated research facilities are available in the MadLabs. Students at DSU are given access to industry-standard software and a virtual IA Lab to meet all their computing needs. Table 12 shows the software that is utilized in classes in the MSA program at DSU.

Table 12. **Software Used in Analytics Classes**

Course	Instructor(s)	Software	Version	Notes
INFS 762	Jun Liu	SAS, Tableau, PowerBi	9.4, 2021.4.3, Desktop version	License by DSU, installed in IA virtual lab, Free for academic use, Free from Microsoft
INFS768	David Zeng	Python Jupyter Notebook, Google Co-Lab	v3	Free open source
INFS 770	Jun Liu	Python Jupyter Notebook	v3	Free open source
INFS772	David Zeng	Python Jupyter Notebook Google Co-Lab	v3	Free open source
INFS 774	Jun Liu	Hadoop, Spark	2020 3.2, V3	Free from Cloudera in IA virtual Lab, Open Source in IA virtual Lab
INFS 776	David Zeng	Tableau PowerBi	2021.4.3, Desktop version	Free for academic use, Free from Microsoft
INFS 778	David Zeng	Python Jupyter Notebook, TensorFlow 2, Docker, Google Co-Lab,	v3, v2, v20	Free open source
INFS 784	David Zeng, Jun Liu	Python Jupyter Notebook TensorFlow 2 Gym by OpenAI Google Co-Lab	v3, v2, 0.22	Free open source
INFS 720	David Bishop	Lucid Chart		Free trial version
INFS 764	Ronghua Shan	Oracle	19c	Free through Oracle Academy Membership
INFS 730	Chris Olson	PhpStorm	2021.3.2	Free with an academic license from JetBrains
STAT 601 STAT 602	Chris Saunders	R, Python	v4, v3	Free open source

PART 8: ASSESSMENT AND STRATEGIC PLANS

Program Assessment

The MSA program began at DSU in Fall 2014. The first program review of the MAS program will be conducted in April 2022.

Program Outcomes

Program Outcomes for the MSA program were crafted in the program proposal and approved by the South Dakota Board of Regents in April 2014. Upon graduation, MSA students will
- be able to prepare and transfer big data sets into actionable information in an easy-to-understand format to support analytics through the use of advanced data processing tools.
- be able to select the appropriate analytics techniques and apply advanced analytical tools to solve data analytics problems.
- be able to demonstrate a good understanding of using information technology and computing languages to implement analytics solutions.
- be able to assess alternative approaches and infrastructures for implementing big data analytics.
- be able to manage data analytics projects to ensure delivery of a successful data analytics initiative throughout its life cycle.
- be able to interpret the results of the analysis.

Curriculum Mapping

We mapped the relevant MSA courses to each of the program outcomes. As shown in Table 14, several courses were developed to address each outcome. For instance, the first learning outcome is about using data processing tools to prepare data for analytics. Although most of our core and required analytics courses teach data processing, the courses mapped to the learning outcome in Table 14 are particularly relevant.   INFS 762 focuses on the ETL process for retrieving and processing data. In INFS 768, students learn the whole data processing process from importing data, to missing value imputation, to categorical variable encoding, and to data splitting. INFS 770 teaches students how to process textual for text mining and social network data for social network analytics. INFS 774 focuses on processing Big Data using Hadoop and Spark, and INFS 778 teaches students to process image data for deep learning.

Table 14. **Mapping between MSA learning outcomes and courses**

Learning outcomes	Courses
be able to prepare and transfer big data sets into actionable information in an	INFS 762 Data Mining Data Warehousing INFS 768 Predictive Analytics

easy-to-understand format to support analytics through the use of advanced data processing tools.	INFS 770 Advanced Data Mining INFS 774 Big Data Analytics INFS 778 Deep Learning
be able to select the appropriate analytics techniques and apply advanced analytical tools to solve data analytics problems.	INFS 768 Predictive Analytics INFS 770 Advanced Data Mining INFS 774 Big Data Analytics INFS 778 Deep Learning STAT 601 Modern Statistics I STAT 602 Modern Statistics II
be able to demonstrate a good understanding of using information technology and computing languages to implement analytics solutions.	INFS 772 Programming for Analytic STAT 600 Statistical Programming INFS 768 Predictive Analytics INFS 770 Advanced Data Mining INF 778 Deep Learning
be able to assess alternative approaches and infrastructures for implementing big data analytics.	INFS 774 Big Data Analytics INFS 762 Data Mining Data Warehousing INFS 778 Deep Learning INFS 784 AI Application INFS 756 Cloud Computing and Network Services
be able to manage data analytics projects to ensure delivery of a successful data analytics initiative throughout its life cycle.	INFS 768 Predictive Analytics INFS 770 Advanced Data Mining STAT 601 Modern Statistics I STAT 602 Modern Statistics II
be able to interpret the results of the analysis.	INFS 768 Predictive Analytics INFS 770 Advanced Data Mining INFS 762 Data Mining Data Warehousing INFS 776 Business Intelligence and Visualization

Evidence of Student Learning

Since 2014, the total number of students that have been enrolled in the MSA program is 264. Among them 140 students have graduated for an overall graduation rate of 53.03%. The average GPA of all MSA students is 3.841.

Comprehensive exam

MSA students are required to pass the comprehensive exam to graduate. The MSA comprehensive exam was first developed and administered in Spring 2017. The exam includes short-answer questions from each of the following core classes for a total of 25 questions: predictive modeling, data warehousing, advanced data mining application, programming for analytics, data warehousing, and Big Data analytics. The test includes 20 questions randomly selected out of the 25 questions. The exam is open-book and open-notes, but students are not

allowed to search the Internet. Students need to obtain at least 60 out of 100 points to pass the exam and need to complete the exam with a proctor within a 2.5-hour limit. Table 13 shows the comprehensive exam results in the respective classes since 2017. Students who fail the comprehensive exam are allowed to re-take the exam after at least one month.

Table 13. **Comprehensive exam results**

Year	Number of Students	Students passed	Students failed*	Average score
Spring, Summer, Fall 2017	11	11	0	85.9%
Spring, Summer, Fall 2018	20	20	0	87.5%
Spring, Summer, Fall 2019	29	27	2	78.7%
Spring, Summer, Fall 2020	31	31	1	83.0%
Spring, Summer, Fall 2021	29	29	0	86.3%

*Those students who failed the exam all passed the exam in the second attempt.

IDEA Student Course Surveys

DSU faculty administrates the IDEA Student Ratings of Instruction survey for each course at the end of the semester. The MSA courses have received very positive responses from the students. Table 14 shows the latest IDEA survey results for the core/required courses offered by DSU faculty.

Table 14. Overall student ratings from IDEA course surveys (5 point scale)

Course	Semester	A. PROGRESS ON RELEVANT OBJECTIVES	B. RATINGS OF SUMMATIVE QUESTIONS (AVG. OF EXCELLENT TEACHER AND EXCELLENT COURSE)	C. Summary (Avg. of A & B)
INFS762	Fall 21	4.6	4.9	4.8
INFS768	Fall 21	4.5	4.4	4.5
INFS772	Spring 21	4.3	4.2	4.3
INFS770	Spring 21	4.5	4.7	4.6
INFS774	Summer 21	4.5	4.4	4.5

Next Steps

For the next review cycle, we plan to develop and administrate a "alumni survey" to further assess if our MSA program meets its objectives. We will strengthen our good relationships with companies that hire MSA graduates and adjust our curriculum to the national and regional trends.

Aligning the MSA program with DSU's Strategic Planning:

In 2015, new university President Dr. Griffiths used this campus-wide work as a basis to define the institution's five-year strategic plan, Excellence through Innovation: Vision 2020. The goals were also informed by the University's Academic Quality Improvement Program, associated 48 with accreditation in the Higher Learning Commission of the North Central Association. The goals are:

Goal 1: Educate to Inspire - Dedicated to academic quality and excellence, DSU promotes active engagement in scholarship, teaching, and learning to prepare students to excel in their disciplines and be leaders in their communities.

Goal 2: Grow to Thrive - Dedicated to student access and success by improving access and opportunity, DSU will enroll, retain, and graduate a larger, more diverse student body.

Goal 3: Innovate to Transform - Dedicated to continuous improvement by continuously enhancing our academic programs, university facilities, student services, and campus technologies to become a more effective and efficient university.

Goal 4: Collaborate to Lead - Dedicated to internal and external partnerships by fostering collaborative relationships with internal and external stakeholders, DSU will expand educational opportunities for students.

Table 15 shows how the MS in Analytics program align with DSU's strategic goals and initiatives.

Table 15. Alignment of IS Programs with DSU's Strategic Plan

Goal	Initiatives relevant to MSA	MSA Response
Goal 1: Educate to Inspire	Initiative 1: Offer innovative and robust academic programs that link to our mission. Initiative 2: Advance inquiry, scholarship, research, and creative activity Initiative 4: Infuse innovative technology in the delivery of academic programs Initiative 5: Support clear and defined learning outcomes to	MS in Analytics together with Information Systems programs are actively exploring accreditation. The MadLab, CBAR, led by Analytics faculty, actively involves MSA students in academic research. Collaborating with MSA faculty, MSA students have published a number of papers in conference proceedings and journals. MSA faculty has strived to use the latest software and technology (see table 12) in their courses. MSA maps the courses with the student learning outcomes (see table

	ensure that DSU graduates are competitive in their fields.	14). The program has 100% placement with highly competitive average entry salaries.
Goal 2: Grow to Thrive	Initiative 1: Optimize undergraduate and graduate enrollment.	The MSA enrollment increased significantly in the first few years. It remains high.
Goal 3: Innovate to Transform Initiative	Initiative 2: Through continuous quality improvement, DSU will evaluate university-wide processes to promote a student-friendly environment	The MSA program reviews the curriculum annually, using input from national trends in the industry to ensure that students are being taught the skills desired by companies who look to hire MSA graduates. We have added courses about cloud computing, AI, deep learning, business intelligence and visualization to enhance the quality of the program.
Goal 4: Collaborate to Lead	Initiative 2: Expand industry, government, and K-12 partnerships to enhance the student educational experience.	The MSA have established good relationships with companies who hire MSA graduates. South Dakota companies such as Sanford Health, Avera Health, OmniTech, and Capital Services have hired MSA graduates and provided our MSA students with internship opportunities.

The next phase in strategic planning, DSU 2025, is already underway. We will consider our strengths and challenges as we bring stakeholders together to move our university forward. DSU's strategy focuses on five pillars: 1) Student Success, 2) Engagement, Governance and Communication, 3) Research, Intellectual Property and Entrepreneurial Growth, 4) Athletics at Dakota State University, and 5) Quality, Sustainability and Resilience. MSA will strive to align with the new goals and initiatives.