Master of Geographic Information Science Program  
(Department of Geography, Environment & Society)  
Graduate Student Learning Goals and Outcomes Assessment

Introduction and Context
Geographic information science (GISc) is concerned with examining spatial phenomena through technologies such as computer mapping and satellite observation of the earth. The Master of Geographic Information Science (MGIS) is a Plan C professional degree program that requires 35 credits of coursework. Additionally, students must complete a professional portfolio that showcases their body of GIS work, a public presentation, and an exit survey that is reviewed with their faculty adviser along with the portfolio at a final meeting. The MGIS program began in Fall 1997 and was one of the first professional GIS master’s degrees in the country. Given the professional nature of the program, we strive to ensure that our graduate students successfully achieve their career goals in a dynamic, technologically-oriented field.

The process leading to the completion of this report has been ongoing for many years now. We have completed two external reviews of the program (1999 & 2006), a ten year plan (2007) and a successful transition to a Plan C program (2010). Our program has evolved from a more traditional Plan B program with a capstone project and oral exam to a Plan C program focused on key coursework and additional culminating experiences such as the portfolio and public presentation. The Plan C better fits the needs of our professional graduate students and has been very successful since it was initially adopted in Fall 2011. Due to the dynamic nature of the GIS profession, we regularly review and revise the curriculum to reflect changes in market needs; our last curriculum review occurred in June 2012 and changes to our curriculum have been made as recently as Spring 2014. We also consult on an annual basis (or more if necessary) with our MGIS Advisory Board; our last meeting was held on campus in May 2014. This distinguished panel is comprised of senior GIS professionals in various sectors that advise us about current trends in the market and how our curriculum is meeting the needs of our professional students.

The more recent process leading to this report began with our Director of Graduate Studies and co-Director, Susanna McMaster, attending the August 28, 2014 DGS Workshop on Defining Program Goals. After this, the MGIS Executive Committee met in late September to develop a process for compiling a report by the Fall 2014 deadline. Paul Bolstad and Susanna McMaster, co-Directors of the MGIS program, took the lead in writing a draft report, which was then circulated among the Executive Committee members and revised based on their input. This draft report was then shared with the MGIS graduate faculty, graduate students, and Advisory Board members for their insights. Feedback from these stakeholders was then incorporated in the final report.

MGIS Program Learning Goals
A key goal of our program is to produce highly competent, knowledgeable and experienced GIS professionals and practitioners. The GIS profession has matured since its beginnings in the 1990’s with the development of GISP certification through the GIS Certification Institute, the GISc &Technology Body
of Knowledge (BoK) and the Department of Labor’s Geospatial Technology Competency Model (GTCM)—all effective guiding frameworks for developing curriculum and experiences that ensure our students are equipped with key competencies to be successful in the profession. Key learning goals for our students include:

- **Acquiring core/advanced knowledge in GIS&T**
  Students should learn fundamental and advanced knowledge in areas such as spatial analysis, data acquisition, and map projections, as detailed in the GIS&T Body of Knowledge. Our core curriculum (together with elective and technical courses) is designed to provide students with these key knowledge areas. Core courses provide the conceptual and theoretical underpinnings for a comprehensive, well-rounded knowledge of GIS, including an introductory seminar in GIS project management and professional development for entering students. Elective courses provide additional breadth to the program by allowing students to take courses related to their area of interest.

- **Acquiring critical technical skills**
  A strong grasp of technical skills, e.g., GIS programming and databases, is essential for students entering a highly technical, dynamic field. Our technology courses (together with core and elective courses) are designed to provide students with these key knowledge areas. Technology courses focus on specific software and techniques in GIS while certain elective courses, e.g., computer science, can complement the technology courses and provide additional depth for students interested in GIS development.

- **Practicing problem-solving and critical thinking**
  Students must be capable of applying core knowledge and technical skills to practical problem solving and critical thinking. There are many ways in which students can gain this experience through course work (e.g., Urban GIS (GEOG 5564) or GIS in Environmental Science and Management (FNRM 5295)), internships (e.g., GIS 5530 internship credits), GIS and remote sensing research project credits (GIS 8990-Research projects in GIS, FR 8205-Research problems: Spatial data analysis), and/or research assistantships (e.g., U-Spatial) and student worker positions (e.g., state agencies like the MN Department of Natural Resources).

- **Developing the ability to innovate**
  Students must develop the creativity and skills needed to excel in innovative tasks. In *The New Geography of Jobs*, economist Enrico Moretti makes a strong, evidence-based case that innovation is the key driver of economic development in the U.S. Students ability to innovate with regard to custom app development, process improvements, and other activities is therefore of great value to employers in all sectors. GEOG 5562: GIS Development Practicum, CI 5365: Contemporary Software Development Tools and GIS 8990 as well as other independent project courses provide our students with opportunities to develop innovation capabilities.

- **Undertaking professional development and ethical awareness**
  Students must learn about becoming successful, competent GIS practitioners by actively participating in professional development and career planning as well as developing ethical awareness through mechanisms such as [GISP Code of Ethics](#). For example, students in our
required GIS 8501 seminar on GIS Project Management and Professional Development must explore GIS ethics through a case-based approach.

- **Developing professional competencies**
  GTCM outlines not only GIS-related knowledge but other professional competencies that successful professionals should possess such as effective oral and written communication skills, leadership, and successfully working as part of a team. Our course work and related program requirements incorporate experiences with these competencies but students are also encouraged to engage in additional activities that expose them to competencies such as serving in the GIS Student Organization’s event planning and proposal writing.

- **Being a lifelong learner in a dynamic field**
  As students in a dynamic, technologically-oriented field it is critical that they cultivate the idea of lifelong learning to ensure they stay current in the field beyond what they learned in the program. We encourage our students to develop an awareness of future trends in the field and how to anticipate the impact of these trends on their careers.

**Assessment of MGIS Learning Goals and Outcomes**

We have several ways of assessing student learning outcomes to ensure learning goals are being met. These include:

- **Periodic review of our curriculum**
  Our program periodically conducts a review of our curriculum against the GIS&T BoK to ensure that student learning goals and competencies are covered in our array of courses.

- **Requiring the development of a Portfolio**
  Each student in the program is required to compile and submit a digital portfolio that showcases their learning outcomes through the projects and other work highlighted in their portfolios. The portfolio can also be used as a tool to support the professional GISP certification application process.

- **Requiring completion of an Exit Survey**
  Each student in the program is required to complete an exit survey that seeks feedback on his/her program experience from start (application process) to finish (degree completion process). The survey includes a self-assessment of the student’s learning outcomes related to his/her coursework and other key experiences such as internships, research assistantships, and public presentations.

- **Requiring a final adviser meeting**
  Each student is required to meet with his/her adviser as part of the final phase of the degree completion process to discuss the exit survey, portfolio and plans beyond the program.

- **Regular consultation with our Advisory Board**
  We consult at least annually with our MGIS Advisory Board members to secure their feedback on current market trends and how our program is preparing students to ensure they possess key competencies expected by the profession.

- **Periodic survey of alumni**
We periodically conduct online surveys of our alumni to determine how their program experience has prepared them for the professional world. While the exit survey gives us feedback about student learning outcomes when they graduate, we have found it valuable to gather feedback from alumni once they have secured jobs and have additional insights about learning outcomes as they relate to their current careers.

- **Tracking hiring and job placement success**
  A key indicator of achieving learning goals and outcomes is the high level of job placement experienced by our graduate students; over 95% of our students are hired into GIS positions by degree completion or shortly thereafter (some are even hired while still working on their degrees). See our web site for a listing of our graduates and their job positions.

- **Tracking student recognition and advancement in the profession**
  Another useful indicator of successful achievement of goals is illustrated by professional awards and other recognition received by our graduates as well as their advancement/promotion in the positions they hold. For example, we have started to collect anecdotal evidence regarding the impact of our program on the local GIS profession. One of our graduates has been the recipient of the Minnesota GIS/LIS Polaris Leadership Award, which is a mid-career award. Additionally, Minnesota has a Statewide Geospatial Advisory Council, which is authorized by the State Legislature and consists of 22 appointed positions. Currently four of these seats are held by MGIS graduates. Finally, we have seen many of our graduates promoted into higher level positions within the same job or they have moved to jobs with higher levels of responsibility.

**Conclusion**
This document is a work in progress. GIS is a dynamic field and relatively new profession that is maturing in terms of professional certification and workforce development. Our program aims to respond to these changes to ensure our students can meet market demands. As professional GIS certification continues to gain in numbers, we must keep this trend in mind as our program evolves. For example, the GIS Certification Institute’s GISP certification, which is currently documentation-based, eventually will require an examination based on the Department of Labor’s Geospatial Technology Competency Model; we will be evaluating this change as it relates to our program. Additionally, the GIS&T Body of Knowledge is currently under revision (GIS&T BoK 2.0) so we will conduct another curriculum review to assess how our curriculum compares with the updated version.

Our key goal is to ensure we are meeting the professional goals and needs of our graduate students so they continue to secure successful employment in a highly technical, dynamic field. Using the assessment tools described above, we will continue to secure feedback from our students, graduate faculty, alumni, and Advisory Board members to achieve our program goals.