UW Tacoma | MS Geospatial Technologies
Program Report
AY 2014-15 -> AY 2018-19

1. Program overview

The Master of Science in Geospatial Technologies (MSGT) degree program was launched in the autumn quarter of 2014. This degree trains students to use and apply geospatial hardware, software and data in urban and environmental planning scenarios with the aim to prepare those students to become leaders in the management and utilization of geospatial technologies. The program was designed as a one-year (four-quarter), cohort based graduate degree. Rough outlines of the eight required courses were developed during the 2013-2014 academic year, and two assistant professors were hired in spring 2014 to complete the development of the curriculum and to teach in the program during the 2014-2015 academic year.

The MSGT is housed in the School of Urban Studies at UW Tacoma and is administered by faculty in that unit. The degree leverages and expands upon existing geographic information systems (GIS) capacities within the School of Urban Studies that include a Certificate Program in GIS and an undergraduate degree option in GIS and Spatial Planning. By building on the School of Urban Studies' thriving GIS curriculum, the MSGT exists in a socio-technological ecosystem that includes computing and technical infrastructure, faculty resources, student interest, and regional professional networks. And unlike other regional graduate programs that focus primarily on GIS, the MSGT at UW Tacoma is distinct in its emphasis on a breadth of geospatial technologies that also includes the increasingly central role of mobile computing. So while the graduate degree provides advanced training in GIS, it also offers considerable training in the development and deployment of location-based mobile applications and the management of web-based geospatial data. At UW Tacoma there is no other graduate program that focuses on geospatial technologies. And at the national level, though there are analogs to the technical curricula offered at UW Tacoma, the MSGT is distinguished by maintaining a theoretical/critical focus on the application of these technologies to urban and environmental problem solving.

2. Program faculty

- Matthew Kelley, PhD
    - Associate Professor, Urban Studies and Graduate Program Coordinator
- Jim Thatcher, PhD
    - Associate Professor, Urban Studies
- Emma Slager, PhD
    - Assistant Professor, Urban Studies
- Gregory Lund, MGIS
    - Lecturer, Urban Studies and GIS Lab Manager

3. MSGT Students

2014-2015
19 Applications, 18 Offers, 18 Admissions, 15 Graduates

2015-2016
30 Applications, 20 Offers, 19 Admissions, 15 Graduates

2016-2017
19 Applications, 17 Offers, 16 Admissions, 16 Graduates

2017-2018
29 Applications, 17 Offers, 16 Admissions, 16 Graduates

2018-2019
30 Applications, 26 Offers, 20 Admissions, 17 Graduates

2019-2020
26 Applications, 23 Offers, 14 Admissions, -- Graduates

Enrollment in the MSGT has aligned with expectations. As a graduate program housed at a smaller regional campus, strategic recruitment has been key to sustained enrollment of high-quality students. To that end, the bulk of our recruiting has occurred locally and regionally, and more targeted efforts have been made to draw applicants from the national/international pool.

For the 2013-2014 inaugural year, recruitment focused largely on graduates of the Urban Studies' GIS Certificate Program and local and semi-regional members of GIS professional organizations. Due to growth in the GIS Certificate Program and increased popularity of the program among non-matriculating students at UWT, there was considerable interest in the MSGT from students who were already affiliated with Urban Studies. Our expectation, given the amount of time that we had to recruit in 2013-2014 and the amount of existing interest at UWT, was that our first cohort would be composed primarily of 'homegrown' graduate students.

Aiming for a first cohort of ~15 students, we had 19 applicants which yielded 18 registered graduate students. Of the applicants, 15 were graduates of the GIS Certificate Program at various points in time.

In the first year of the program the faculty identified several areas of improvement that would help to focus our recruiting efforts for the second cohort. Our goals for the second cohort were: 1) to compose a cohort more balanced with new UWT students and 'homegrown' students who have previously completed the Urban Studies GIS Certificate Program, 2) to recruit students from outside the state in order to improve the diversity of experience and ideas in the program, 3) to identify sources of funding for students to support graduate students while they are in residence at UWT.

Actions that were taken to achieve our goals for the second cohort included: 1) the Urban Studies Program hired a part-time graduate recruiter who was responsible for working both on and off campus to conduct recruiting activities, 2) direct engagement, via email and personal correspondence, with faculty at universities and colleges that offer relevant undergraduate training, 3) increased presence at local, regional, and national scholarly and professional conferences, 4) participation in the UW graduate 'Top Scholars' program (which provides matching funds for exceptional graduate recruits), 5) initiation of a teaching fellowship within the undergraduate GIS Certificate Program for a matriculating graduate student, 6) identifying exceptional international student applicants in order to request international student tuition waiver from UW.

Generally, the impact of our recruiting efforts were seen as successful when our second cohort was finally complete prior to the autumn 2015 quarter. We had, for instance, 30 applications to the program (an increase of 50% from our

first year). 20% of the applications came from prospective students outside of the state, and 57% were applications from prospective students who had not previously attended UWT. Our yield from the 30 applications was a cohort of 19 graduate students, 42% of whom had not previously attended UWT, including one international student. Other than the international student, only one applicant from out-of-state chose to join the MSGT. This was due entirely to the cost of the program and the lack of funding for graduate students within Urban Studies.

Efforts to identify funding for graduate students prior to the start of our second year were nominally successful. Though we applied, as a unit, and received Top Scholars funding, after recruiting two prospective students to participate in research related to the Top Scholars program, we were unable to identify a source (either internally or externally) for matching funds and could not proceed with the Top Scholars award. The students who were recruited for this opportunity declined to join the program without funding (they were both out-of-state recruits). Our efforts, however, to secure funding for an exceptional international student via the UW international student tuition waiver program were successful, and we were able to provide a tuition waiver to a student from China who did join the cohort. Finally, though we were not able to formalize the graduate teaching fellowship in time to use it as a recruiting tool for our second cohort, we were able to offer the fellowship as a funding and professional development opportunity for a student from within the second cohort beginning in winter 2016.

For the 2016-2017 academic year, the faculty set goals to increase the diversity of the program and to recruit more heavily from the pool of non-UWT graduates in the South Sound region. To accomplish these goals, concerted efforts were made by the recruiter and faculty to connect with local agencies, to participate in local meetings and conferences, and to reach out to groups such as Washington Women in GIS in Tacoma.

For the 2016-2017 cohort we received 19 applications and 17 were offered admission. Of those applications: 50% were female, 15% were from out-of-state, 37% were from non-Caucasian applicants, 84% were from non-UWT graduates. 16 of the applicants accepted admission to the 2016-2017 MSGT cohort. Continuing the program that we started in 2015-2016, one applicant was offered financial support via a teaching assistantship (funding to train and support a student to teach introductory GIS courses) in our undergraduate GIS program.

The overall diversity of the 2016-2017 cohort (50% female, 25% non-Caucasian) reflects efforts by the program to attract diverse applicants to a technical program. Similarly, the ratio of non-UWT graduates to UWT graduates in the 2016-2017 cohort highlights the work that was done by the program to make in-roads with local and regional professionals in the geospatial industry.

Recruiting for the MSGT continued in a targeted way for the 2017-2018 academic year with our focus remaining on local and regional pools of candidates as well as reaching out to a diverse range of prospective students. Funding opportunities in the program continued to include a teaching assistantship, international student tuition waiver, and scholarships funded by donations to the program. 26 applications were received, 24 applicants were offered admission and 16 students joined the program. The composition of the 2017-2018 cohort (75% female, 19% non-caucasion, 50% new to UW Tacoma) again reflects efforts made to diversify the program.

No changes were made to the recruiting plan for the 2018-2019 academic year, and the cohort composition (60% female, 35% non-Caucasion) once more aligned well with the long-term vision and expectations for the MSGT at UWT.

4. Changes to the program

Curriculum
Following the inception of the MSGT the expectation was that by the end of the first year there would be adjustments to make. In late-summer 2015, the faculty, graduate program coordinator and director of Urban Studies met to assess the first year of the program. At this meeting the following points were noted and adjustments were planned for the 2015-2016 academic year.

1) Students had less training in computer programming than was expected and the curriculum, as designed, did not allow for extra time to be spent providing more general instruction in this area. Faculty suggested, therefore, that two courses be re-sequenced in the second year as a way to better prepare students for more complex technical processes. Specifically, 'Web GIS' was moved from the winter quarter to the autumn quarter, and 'GIS Automation' was moved from the autumn quarter to the winter quarter.

2) 'Application' courses, which are offered in the third quarter, were identified as moments in the curriculum that should be oriented more clearly on teaching students how emergent geospatial technologies are applied in real world scenarios (urban and environmental planning). In the second year, these courses were redesigned to be more 'lab' driven and to provide additional opportunities for graduate students to interact with industry-standard software.

3) Student expectations were not consistent with program learning outcomes during our first year as related to capstone requirements, hardware and software which were provided to them, and the amount of interaction with industry-standard GIS software. To better manage student expectations, a more comprehensive student handbook was written for distribution among the second cohort prior to the start of the academic year.

4) Access to certain software for students who worked in the GIS lab was not as easily managed as we had expected. This had to do with licensing issues as well as the level of access which students are given on university computers. In the second year we experimented with virtual desktops as a way to maintain better control over our software environment.

5) Students were disappointed with the amount of exposure that they had to a particular industry-standard software package (ESRI's ArcGIS). Curriculum in the second year was revised to increase exposure to this software. Faculty suggest that they will employ this ArcGIS in 53-80% of relevant assignments.

6) There was no comprehensive end-of-the-year research event for the first cohort. We recognized the need for this type of event and organized a research showcase for the end of the second year.

Changes to the program following the second year are more a result of honing and refining the curriculum than the more sweeping curricular adjustments made following year 1. At the end of the summer 2016 term, faculty again met to discuss outcomes and aspirations. Changes to the curriculum for the 2016-2017 year were more minor - additional emphasis, for instance, on a particular scripting language. More substantive conversation happened with regard to the pacing of the capstone portion of the program and the presentation of outcomes at the graduate showcase event. In particular, the first course of the two-course capstone sequence was moved from the spring term to the winter term for the 2017-2018 academic year. This change was designed to provide students with additional time to work through technical aspects of their capstone projects during the spring term after they complete proposals in the winter term.

For the 2017-2018 academic year, one of the two 'application' courses offered in the spring term was replaced with a graduate level cartography course. This change reflected the overlap between the two application courses and the need, within the MSGT, for a stand-alone cartography/design oriented course. Additionally, in 2017-2018 faculty worked together to identify opportunities in the curriculum to provide students training in the usage of servers. To that end, arrangements were made to provide students with access to Amazon Web Services (AWS).

No significant curricular adjustments were made prior to the 2018-2019 academic year. This is to be expected as the program, by autumn 2018, had been refined for four years prior.

Budget
The MSGT is supported primarily through central funds allocated by the School of Urban Studies. Adjustments to the

MSGT budget have come in the areas of recruiting, student funding, and lab management. When the MSGT was launched, a part-time recruiter was funded by the School of Urban Studies. Following the 2018-2019 academic year the recruiting position was eliminated (though resources were partially re-allocated to the MSGT through a central budget that can be used by the faculty of the program to conduct recruiting activities). Additional adjustments to the MSGT budget following the 2018-2019 academic year resulted in the elimination of the graduate teaching assistantship that had, since the 2016-2017 academic year, been used to recruit and fund one student per year in the program (noted here that the elimination was due entirely to budgetary complications beyond the control of the unit). Finally, beginning in the 2019-2020 academic year, management of technology and computing facilities shared by the MSGT program and the undergraduate spatial planning and GIS certificate program has been funded as a part of a full-time lecturer/lab-manager hire made during the 2018-2019 academic year.

Faculty and Staff
Changes to faculty and staffing since the launch of the MSGT have included the replacement of one tenure-track faculty member who left UWT, the loss of the part-time recruiting position, and the consolidation of graduate advising in the School of Urban Studies.

5. Progress of the program

The MS in Geospatial Technologies was developed to provide the School of Urban Studies a much-needed advanced and applied degree that would allow students to engage with and provide evidence-based planning solutions to a range of emergent social and environmental problems from a geospatial perspective. And, given the centrality of social justice to the School of Urban Studies and its unique focus on providing service to the local and regional community, we expected that the graduate program would amplify the impact that students have on the 'real world'. It is important to note that the graduate degree was proposed from within an urban serving university by the only unit at UW Tacoma dedicated exclusively to engaging with contemporary urban issues. For these reasons the focus of the graduate degree on the application of advanced geospatial technologies to contemporary social and environmental problem-solving was key.

The aim, in other words, was not simply to train students to understand and utilize geospatial technologies. Rather, the aim was to extend the existing mission of the School of Urban Studies by enhancing students' abilities to engage with complex problems that require the use of advanced geospatial technologies for acquiring, organizing, and analyzing large datasets. By training students to serve as practitioners who understand the effective and appropriate usage of geospatial technologies, the impact of the MSGT was expected to be significant and immediate for local and regional agencies that grapple with an emergent technological landscape increasingly undergirded by geospatial information.

Finally, given that it is housed at an urban serving institution, the MSGT has endeavored to provide educational opportunities to segments of the population who might otherwise not participate in graduate education. The MSGT was situated precisely at the intersection of a discipline (Urban Studies) that appeals broadly to underserved urban populations and a fast-growing technological industry (geospatial tech). As such, since a large number of students at UW Tacoma are the first generation in their families to attend universities, are female, are from diverse racial and ethnic backgrounds, are older, and/or are veterans, the MSGT was well-situated to contribute significantly to the development of a diverse geospatial workforce.

In the first five years of the MSGT the program has been quite successful at meeting the goals that were detailed when the program was proposed. As detailed in the previous section, curricular decisions have been driven by a combination of factors that represent the direction of the industry, the interests of students in the program, and the specialties of the faculty who teach the courses. In its current incarnation, the MSGT is an excellent example of a graduate program that has evolved in concert with stakeholders both within and outside of academia. Notably, the core mission of the program to provide opportunities for advanced geospatial training that is undergirded by an ethos of social justice and critical

thinking has not wavered. In point of fact, the recent faculty search that was initiated to replace one of the original faculty members sought an expert in geospatial systems that was also fluent in critical social theory.

Adjustments to the program such as the introduction of Amazon Web Services, Augmented Reality Devices, a physical server in the GIS lab at UWT, and Microsoft Azure Services are all representative of efforts that have been made by the MSGT program to improve the educational experience for its students. Similarly, ongoing partnerships with local and regional agencies such as the City of Tacoma, Pierce County Spatial Services, Pierce Transit, Washington Department of Transportation, Washington Department of Ecology, Metro Parks Tacoma, Microsoft, Amazon, ESRI, Washington Urban and Regional Information Systems Association have led to countless research, internship, and employment opportunities for students of the MSGT at UW Tacoma.

Recruiting, as detailed in section 3 of this report, has focused largely in recent years on increasing the diversity of MSGT cohorts. These efforts have successfully led to MSGT cohorts that are representative of a wide range of diverse backgrounds and identities. Faculty of the MSGT are particularly proud to note that, for a STEM graduate degree, the composition of cohorts with 50-75% representation from female students is highly unusual and emblematic of the importance that the program places on cultivating an environment that is welcoming and accommodating of students from diverse backgrounds.

6. Challenges

During the first five years of the program, challenges faced by the MSGT have felt 'normal' for a new program that exists in an evolving disciplinary space. As discussed above, curricular challenges were addressed early on in the program. The MSGT curriculum has not experienced any form of dramatic curricular revision since year four. Technical challenges have been ongoing in the MSGT in that the program must be in a constant state of change as the technological landscape evolves alongside the expectations of stakeholders (students and community partners). The MSGT has made efforts to manage these challenges by allocating increased resources to lab and computing equipment and by asking for and receiving funding to designate a part time (percentage of a new lecturer hire) lab and technology manager.

Perhaps the greatest challenge faced by the MSGT came following the third year of the program when a core faculty member announced her departure. This departure became disruptive for students in the graduate cohort and required the remainder of faculty in the program to conduct an unexpected mid-year faculty search. Fortunately, the search was successful and the new hire has settled into the program; but the impact on morale among graduate students was notable. Given the size of the MSGT and undergraduate GIS programs at UW Tacoma, the loss of a faculty member is significant (there are currently only three tenure/tenure track faculty and a portion of one lecturer teaching and administering the unit). Future plans within this unit include the addition of another tenure track faculty member that could work between the graduate and undergraduate programs and then fill in as needed should another faculty member leave the university.

Budgetary challenges have impacted the MSGT in recent years as seen most prominently in the loss of a dedicated recruiter and in the loss of the funded Graduate Teaching Assistantship. The loss of the TA, though unfortunate, has led to thinking about identifying alternative ways to support graduate students in the program; particularly those who come from out of state. Similarly, while the recruiter position was eliminated, the MSGT (and undergraduate GIS programs) has been allocated a pool of funds to use for general purposes. The faculty voted to draw a large portion of these funds for recruiting purposes and have, in the current year, begun thinking about alternative ways to conduct recruiting for the graduate program.

In the upcoming five years, the MSGT is expected to continue to formalize operations within the School of Urban Studies and alongside the undergraduate GIS programs. It is likely that the greatest challenge for the MSGT in the coming years will be to successfully establish set of governing procedures that explicitly and legibly unite the undergraduate and

graduate programs through an administrative infrastructure. The reason that this is occurring now, and not earlier in the evolution of the MSGT, is that Urban Studies was only granted School status at the beginning of the Autumn 2019 term. Thus, like the other units within the school, the MSGT and GIS faculty are currently working to establish infrastructure.

7. Goals

The MSGT at UW Tacoma is intimately tied to the nascent Geospatial division within the newly formed School of Urban Studies. Programmatic goals are, therefore, a function of the efforts among the GIS faculty to formalize processes and infrastructure while continuing to grow the graduate degree in innovative and relevant directions. While the undergraduate program in the division grows and evolves, it is expected that the graduate program will continue to provide the advanced level of study and practice that has distinguished it over its first five years of existence. It is hoped that at some point during the next five years an additional faculty member will be added to the division and that this person's research interests will augment the graduate curriculum. With regard to recruiting and growth, the MSGT is at its functional capacity (given the size of the faculty and space in labs) with a cohort of 20 students. To this point, the program has aspired to 20 students per year and has been at or near that number every year. Recruiting efforts will, therefore, focus less on growing the program than retention and sustaining the diversity of the program. Efforts are also planned to improve funding opportunities for graduate students so as to improve the ability to recruit students from out of state.