

## STUDENT LEARNING ASSESSMENT PROGRAM SUMMARY FORM *AY2022-2023*

Program Name: Professional Science Masters in Geographic Information Science (PSM in GIScience)

Dept: Geology/Geography

College: College of Liberal Arts and Sciences

Submitted by: David Viertel, Program Coordinator

### Part 1:

The learning objectives for the PSM in GIScience program presented on the following pages are classified by CGS learning goal. Objectives are assessed in the classroom, as well as in reports, presentations, and professional settings if the situation allows (for instance both internship reports and assessment of any conference presentations). Data collection methods include the following assessments:

#### 1. Classroom Evaluations

When possible, learning goals are assessed through the evaluation of select student classroom work. For instance, when students complete a research paper, their work is assessed and reported via the standard Geography Paper Assessment Evaluation instrument (See Appendix A). Likewise, if students are required to perform a class presentation, their work is assessed on the Geography Speech Assessment instrument (See Appendix B). Most other classroom evaluation is assessed based on *embedded content questions* in essay exams. This allows students to demonstrate a broader understanding of geospatial fundamentals. For standardization purposes, all classroom work is assessed on a likert scale ranging from 1 (No discernible ability), to 2 (Minimal ability), to 3 (Satisfactory ability), to 4 (Significant ability), and finally 5 (Superior ability).

#### 2. Final GIS (Internship) Written Report

When students complete the Certificate of Comprehensive Knowledge requirement of the EIU graduate school, they are required to submit a *written report* of a GIS research or professional project. In practice this report tends to be linked to the student's required internship activities (though the option to complete supervised research exists as well). This objective is typically completed immediately prior to graduation. The written report is required to be comprehensive and succinct, demonstrating professionalism and ethical responsibility. Research and methods references must be appropriately cited and sourced. Project reports are currently evaluated by the Graduate Coordinator as well as one other graduate faculty member (either Barry Kronenfeld or Chris Laingen as, time allows). Work is evaluated quickly with the opportunity for feedback and revision.

### 3. Final GIS (Internship) Project Presentation

In conjunction with the written report, GIScience PSM students are required to complete a professional presentation on the same internship or research project, in front of faculty and fellow students. At this juncture, students are expected to clearly communicate the purpose, context, and background of their work. Their presentations should be professional and comprehensive, explaining purpose, process, challenges, achievements, analysis, limitations of their work, and future directions or needs. Project presentations are evaluated by all attending faculty (at least two GIScience graduate faculty must be in attendance) and feedback is provided to students with the opportunity to address suggested changes in their written work (see above).

Note: In the 2022-23 academic year the PSM in GIScience had **no students** graduate, leading to a **lack of assessment opportunities outside the classroom environment** (Elements 2 and 3 above). This lack of graduates will be addressed following reports on the individual learning goals.

<b>CGS Learning Goal #1</b> A depth of content knowledge	<b>Program Learning Goal(s): #1a</b> <b>Manage data workflow (create, edit, convert, filter, document) in various GIS formats (vector and raster)</b>
How are learners assessed?	Final project report on internship experience (CCK) as well as classroom assessment questions. Classroom results are collected by individual professors and compiled on a semester basis, while attending professors evaluate student internship final projects.
What are the expectations for the students?	Students will provide evidence of identifying and acquiring multiple relevant data sources, perform appropriate editing, conversion and filter tasks, and properly document and justify their data processing steps.
What are the expectations for the program?	Avg. student achievement will rank significant to superior (4-5 on a 5 point likert scale).
What were the results?	Classroom assessments in three classes yielded a mean of 4.38. This would represent a <b>significant</b> level of understanding for this skill.
How are the results shared? How will these results be used?	Student status and overall content mastery are reviewed in a graduate faculty meeting on a semester-by-semester basis. Results are used to update and focus course curriculum and redesign Intro to GIS (GEO5810), Remote Sensing I (GEO5820) and Remote Sensing II (GEO5870) courses.

<b>CGS Learning Goal #1</b> A depth of content knowledge	<b>Program Learning Goal(s): #1b</b> <b>Construct and visualize data products (maps, interactive databases) to effectively communicate information</b>
How are learners assessed?	Results are measured based upon maps and flow charts associated with term project work collected by individual professors as well as solicited from attending professors at final project presentations (CCK).
What are the expectations for the students?	Students will use thematic maps and interactive visualization tools to effectively communicate results and analysis. Graphic representation should be self-explanatory, with a clear message and appropriate symbolization.
What are the expectations for the program?	Avg. student achievement will rank significant to superior (4-5 on a 5 point likert scale).
What were the results?	Assessment of student abilities to communicate via visualization products was assessed in two classes over the term of this assessment. The mean value yielded by professor evaluations was a 4.67. This would represent a <i>significant to superior</i> level of understanding for this skill. We were happy to see these results since visualization products play such a central role in our industry.
How are the results shared? How will these results be used?	Student status and overall content mastery are reviewed in a graduate faculty meeting on a semester-by-semester basis. We see this improvement as a dividend paid by our 2022 redesign of a graduate Cartography and Visualization course which all students are required to take.

<b>CGS Learning Goal #1</b> A depth of content knowledge	<b>Program Learning Goal(s): #1c</b> <b>Design frameworks and procedures to support GIS data collection, management and analysis.</b>
How are learners assessed?	Final project report on internship experience (CCK) as well as classroom assessment questions. Results are collected by individual professors and compiled on a semester basis, while attending professors evaluate student internship final projects.
What are the expectations for the students?	Students will demonstrate the ability to construct relational geodatabases, procedural geoprocessing models, and/or python scripts to accomplish specific data compilation goals, processing procedures and analysis.
What are the expectations for the program?	Avg. student achievement will rank significant to superior (4-5 on a 5 point likert scale).

What were the results?	Two classroom assessments of the ability to produce value-added products from raw spatial data yielded a mean 4.28. This would represent a <i>significant</i> ability in this category. Though this represents a drop from last years assessment, it should be noted it we have moved this evaluation from the final project presentation to students' earlier-career classes. Attention will be paid to whether students improve at their final CCK project presentation next year.
How are the results shared? How will these results be used?	Student status and overall content mastery are reviewed in a graduate faculty meeting on a semester-by-semester basis. Feedback from earlier results has led to changes in the GEO5810 and GEO5820 foundational classes as well as greater focus on project design in the GEO5000 seminar course.

<b>CGS Learning Goal #2:</b> Critical thinking and problem-solving skills	<b>Program Learning Goal(s): #2a</b> <b>Derive higher-order spatial information from base (raw survey, GPS, satellite/aerial, or other sensor) data sources</b>
How are learners assessed?	Final project report on internship experience (CCK) as well as classroom assessment questions. Results are collected by individual professors and compiled on a semester basis, while attending professors evaluate student internship final projects.
What are the expectations for the students?	Students will clearly define the scope and objectives of their project, including spatial data requirements and appropriate analysis techniques.
What are the expectations for the program?	Avg. student achievement will rank significant to superior (4-5 on a 5 point likert scale).
What were the results?	Assessments of this ability to produce value-added products from raw spatial data across three separate classes yielded a mean 4.3. This would represent a <i>significant</i> ability in this category.
How are the results shared? How will these results be used?	Student status and overall content mastery are reviewed in a graduate faculty meeting on a semester-by-semester basis. Feedback from these results has led to shifts in the final project requirements in GEO5820 , GEO5825, and GEO5870 classes.

<b>CGS Learning Goal #2:</b> Critical thinking and problem-solving skills	<b>Program Learning Goal(s): #2b</b> <b>Place project within correct organizational context and justify expense (both temporal and monetary).</b>
How are learners assessed?	Results are solicited from attending professors at final project presentations (CCK).

What are the expectations for the students?	Students will be able to explain how their internship or research project benefits and supports the cooperating organization and discuss limitations in terms of data quality, time, and available resources.
What are the expectations for the program?	Avg. student achievement will rank significant to superior (4-5 on a 5 point likert scale)
What were the results?	With no internships presentations this year, <b><i>this goal was unable to be assessed.</i></b>
How are the results shared? How will these results be used?	Student status and overall content mastery will be reviewed in a graduate faculty meeting yearly.

<b>CGS Learning Goal #3:</b> Effective oral and written communication skills	<b>Program Learning Goal(s): #3a</b> <b>Communicate all aspects of GIS work from process to analysis in a clear, concise <u>written</u> form.</b>
How are learners assessed?	Professors requiring research projects assess students based on the Geography Paper Assessment Evaluation instrument (See Appendix A). Additionally, supervising professors evaluate student final project written reports.
What are the expectations for the students?	Students will present well-organized, clearly-written reports of process as well as coherent justification and analysis in their work.
What are the expectations for the program?	Avg. student achievement will rank significant to superior (4-5 on a 5 point likert scale).
What were the results?	Written communication was assessed in four classes throughout the year where term papers were expected. The mean for these assessments were 4.6, 4.75, 3.75, and 3.75 respectively. The weighted mean for all written assessments across classes was 4.23 indicating a <b><i>significant</i></b> level of written communication skill for assessed students.
How are the results shared? How will these results be used?	Student status and overall written communication ability are reviewed in a graduate faculty meeting on a semester-by-semester basis. This year represents a high point with four classes assessing written work. It should be noted the two lower averages were from earlier-curriculum classes hopefully implying improvement over the students' tenure.

<b>CGS Learning Goal #3:</b> Effective oral and written communication skills	<b>Program Learning Goal(s): #3b</b> <b>Present and verbally relate work and analysis in an organized, professional, and coherent manner.</b>
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How are learners assessed?	Professors requiring research projects assess students based on the Geography Speech Assessment instrument (See Appendix B). Additionally, supervising professors evaluate student final project oral reports.
What are the expectations for the students?	Students will effectively and professionally deliver an interactive oral presentation explaining project justification, process and analysis.
What are the expectations for the program?	Avg. student achievement will rank significant to superior (4-5 on a 5 point likert scale)
What were the results?	Oral communication and presentation skills were assessed in four classes during the assessment period. The means for these four classes were 4.25, 4, 3.66 and 3.75 respectively. The overall weighted mean of assessed presentations was 3.93, indicating a <b>satisfactory and almost significant</b> communication ability amongst students.
How are the results shared? How will these results be used?	Student status and overall verbal communication ability are reviewed in a graduate faculty meeting on a semester-by-semester basis. Students continue to struggle with this particular expectation and more work is warranted to improve oral communication abilities. This move to an online-exclusive format may also be complicating our assessment of this metric.

<b>CGS Learning Goal #4:</b> Evidence of advanced scholarship through research and/or creative activity.	<b>Program Learning Goal(s): #4</b> <b>Appropriately utilize high-quality research sources and methods in the application and analysis of geospatial problems.</b>
How are learners assessed?	Professors requiring research projects and/or project design (for instance a programming course) evaluate student performance. Additionally, student internship/research reports are evaluated for research and methodological support by supervising professors.
What are the expectations for the students?	Students should be able to identify and obtain high-quality theoretical and procedural literature to support their methods. Analytical methods should show robust support and a strong theoretical underpinning.
What are the expectations for the program?	Avg. student achievement will rank significant to superior (4-5 on a 5 point likert scale).
What were the results?	Learning goal 4 was assessed in three classes during the term in question. Student means for these courses were 4.6, 4.75 and 3.75 for a weighted mean of 4.38. This indicates a <b>significant</b> level of research ability for assessed students.

How are the results shared? How will these results be used?	Student status and overall content mastery are reviewed in a graduate faculty meeting yearly. An emphasis on assessing sources has been added to GEO5000 (PSM Seminar) and more attention has been added to this skill in individual courses.
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<b>CGS Learning Goal #5: Ethics and Professional Responsibility</b>	<b>Program Learning Goal(s): #5a</b> <b>Identify and discuss emerging trends in GIS-related technology, regulations, standards and norms and their impacts on society.</b>
How are learners assessed?	Results are collected by individual professors and compiled on a semester basis (as appropriate PSM seminar or other topical seminars are offered). Additionally, attending professors evaluate student internship final projects (CCK).
What are the expectations for the students?	Students will demonstrate an understanding of emerging web technologies, open source software and volunteered geographic information and be able to discuss the need for spatial data infrastructure as well as controversies regarding data privacy.
What are the expectations for the program?	Avg. student achievement will rank significant to superior (4-5 on a 5 point likert scale).
What were the results?	Students were assessed on their understanding of the state of technology, the importance of open standards, and how these matters impact society in three classes. Individual classes were rated a 4.4, 4.5 and a 4. The weighted mean for these classes was a 4.3 indicating a <i>significant</i> level of achievement in this goal.
How are the results shared? How will these results be used?	Student status and overall content mastery are reviewed in a graduate faculty meeting yearly. This feedback has been used to sharpen the subject matter of both the GEO5000 Seminar and other Seminar offerings (GEO5825 Lidar).

<b>CGS Learning Goal #5: Ethics and Professional Responsibility</b>	<b>Program Learning Goal(s): #5b</b> <b>Identify and model ethical behavior in the professional realm</b>
How are learners assessed?	Students are assessed in the PSM seminar course (where these matters are discussed explicitly) as well as in their internship or research (final project) report.
What are the expectations for the students?	Students will interact with others in a professional manner while adhering to ethical standards of data stewardship, objective analysis, and transparent research practices.
What are the expectations for the program?	Avg. student achievement will rank significant to superior (4-5 on a 5 point likert scale).
What were the results?	PSM seminar students (students in their first semester) in the Fall of 2023 were assessed for their ability to identify ethical behavior and data-handling standards, and their ability

	to present themselves professionally. Overall, professors ranked these students at a 3.75 or <i>satisfactory</i> standard of professionalism.
How are the results shared? How will these results be used?	Student status and overall ethical performance is reviewed in a graduate faculty meeting yearly. A satisfactory in this particular category is <u>not acceptable</u> to the professors involved in the program. It should be noted that only four students were assessed in the above evaluation and two of them have since elected to leave the program. A focus on greater professionalism (indeed greater engagement) has been since added to the seminar class, we may also need to revisit our methods of evaluating applicants.

## Part 2

**Describe what your program’s assessment accomplishments since your last report was submitted. Discuss ways in which you have responded to the Graduate Assessment Summary Response from last year’s report or simply describe what assessment work was initiated, continued, or completed.**

The PSM in GIScience faced a challenging environment in terms of assessment over the past year. One of the greatest factors to overcome was a lack of graduates. Though the program itself has grown, last year saw a lull between the final in-person Masters students graduating in 2021-2022, and what promises to be several graduations in the 2023-2024 school year among the new cadre of online students. In fact, one defense is already scheduled for this November and a further three students should graduate this year.

The impact on assessment was felt in that several goals (specifically 1b, 1c, 2b, and 5b) were highly dependent on evaluating the internship final presentation and paper for completion of the Certificate of Comprehensive Knowledge. We recognized that we had put too much focus on this final completion step in our assessment process. We were able to adjust and cover three of these aspects (1b, 1c, and 5b) through class project work or discussions in the GIScience seminar. Unfortunately, we could not find a way to assess goal 2b (placing project within organizational context and justify expense) within the department. Our students cover this aspect of their curriculum in either MBA or Political Science courses on Organizational Behavior and Budgeting, which we are unable to assess. Though we should have every opportunity to review graduating students in this regard in the coming year, we will continue to seek alternative options to measure ability in this area.



The shift in assessment measure from final project to seminar project likely accounts for 5b (identifying and modelling ethical professional behavior) slipping from a high Significant last year to merely Satisfactory. Though “satisfactory” ethics are certainly not reflective of the achievement we wish our students to have, in this case the evaluation was weighed down by a single outlier who left the program after their first semester.

While most of the measures assessed stayed relatively level, goal 3b (oral communication) decreased from significant to satisfactory. The faculty have spent time considering this regression. We believe a part of the shift is from switching to the online format. It simply becomes more difficult to assess speech communication skills through a zoom window rather than in person. It is recognized that the standard speech rubric we’ve been using for a decade may need to be adjusted to better evaluate a digitally-delivered presentation. We plan to modify this rubric in coming semesters.

The high point of the past year has been that nearly every goal being assessed has been applied to a larger number of classrooms than ever before. Assessments where we had minimal (one or two class) participation now are seeing feedback from three of four sections. Though enrollment numbers may not be great, the ability to increase buy-in among faculty and broaden assessment is a point of pride for us.

With the return of a number of student internship projects to evaluate from planning, communication, and ethics standpoints, we should have a much better read on our students next year by judging the culmination of their academic career in the program rather than simply early-semester work. The challenges faced encouraged the assessment team to be more flexible and reevaluate where and how we monitor student progress.

### **Part 3**

**Summarize changes and improvements in curriculum, instruction, and learning that have resulted from the implementation of your assessment program. How have you used the data? What have you learned? In light of what you have learned through your assessment efforts this year and in past years, what are your plans for the future?**

Assessment has been of great assistance in visualizing the dynamic changes the program has faced over the last few cycles. First the PSM moved from a loose multidisciplinary program without clear focus to a home in Geography providing greater attention to streamlining the curriculum and providing for student needs. The implosion of international student numbers during covid led to a Graduate College-driven shift from Face-to-Face to online delivery and recommitting ourselves to serving mid-career professionals in

Geographic Information Science. Again, a steep learning curve accompanied this shift, assisted by feedback and reflection on student performance.

Beyond direct education goals, assessment activities have helped the department and program recognize a fundamental need to serve our online population without abandoning the needs of those in other programs we support (Political Science, MBA, Tech, and undergraduates) for a Face-to-Face experience. To this end, we are now integrating a Meeting OWL (as already adopted by other departments like Political Science) into our classroom to allow students local participation, live online participation, or asynchronous delivery as best fits a population of working professionals across time zones. Though not without its issues, this technology has allowed real-time participation of remote students with in-class populations. This is a goal our assessment clearly identified as desired by students across demographics.

No doubt further shifts will be necessitated as we continue down the path of allowing remote delivery as an option in many classes. We will keep a sharp eye on not just the desires expressed by students, but also the impacts on outcomes of these changes in delivery.

As our numbers return to pre-pandemic levels, we are focused on growing the program while maintaining the quality of experience our students deserve. Assessment, and our bi-yearly meetings will remain an essential tool in this endeavor.