# *STUDENT LEARNING ASSESSMENT PROGRAM*
# *SUMMARY FORM AY 2019-2020*

**Degree and Program Name:** Professional Science Master's in Geographic Information Science (PSM in GIScience)

**Submitted By:** David Viertel

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## PART ONE

The PSM in GIScience program's objectives are listed in the table on the following page. Nine specific objectives are designated within three broader program goals. Objectives are assessed in the classroom as well as in profession settings on the basis of the following assessment instruments:

**1. Internship Reports**

The internship is conducted in the second year of the degree and requires a proposal outlining the goals of the internship, registration (3-credits) and academic supervision. In 2019-20 the PSM Coordinator served as default academic supervisor for all internships due to faculty sabbatical, but internships may be supervised by other EIU approved graduate faculty members with permission of the PSM Coordinator. Students are required to keep a journal and submit a written report documenting the objectives and accomplishments of their internship. Internship site coordinators agree to provide feedback by phone and/or e-mail during and immediately following the internship.

**2. Final GIS Project Reports**

Students are required to submit a written report of a GIS research or professional project in order to fulfill the Certificate of Comprehensive Knowledge requirement of the graduate school. This is typically conducted just prior to graduation and is often the last requirement to be completed by a student. Projects may be performed as part of the internship or separately. Project reports are currently evaluated by a committee consisting of the PSM Coordinator and one other faculty member, and this evaluation occurs as soon as the written report is submitted.

**3. Final GIS Project Presentations**

Students are also required to do an oral presentation for their final research or professional project. Students are expected to clearly communicate the motivation, background, and context of their project as well as the results and limitations/future work. Project presentations are currently evaluated by a committee consisting of the PSM Coordinator and one other faculty member, and this evaluation occurs as soon as the oral presentation is completed.

**4. Alumni Surveys**

We last conducted an alumni survey in Fall 2018. Per the SLAP 2019 Response recommendations, we will conduct this survey every four years (Fall 2022) to account for issues of small sample size. This time interlude will be shortened as the graduate population increases. The survey includes 20 questions about student experience in the program, current employment, and relevance of the program to their career since graduation.

**5. Classroom Evaluations**

When possible, the three goals are also assessed through the evaluation of select student work in the classroom. These measures may include oral and written rubrics used for classroom research projects or presentations as well as embedded content questions in essay exams to evaluate broader understanding and synthesis of root geospatial fundamentals. Responses to these specific questions are evaluated separately for assessment purposes and reported each semester. This represents a new method of obtaining data for the PSM yearly assessment for 2019-2020. Implementation of this process is still in progress. Last year was challenging due to Dr. Kronenfeld's sabbatical and issues with classes moving online in the Spring, but data from this new effort are included where possible. All classroom assessments are based off the Geography program standard rubric which uses a likert scale. Evaluation options run from 1 (no discernible ability) to 5 (superior ability). Please see Appendices A and B for more detail.

In the 2019-20 academic year we had **five** students graduate from the PSM in GIScience degree program.

| What are the learning objectives? | How, where, and when are they assessed?* | What are the expectations? | What are the results? | Committee/ person responsible? How are results shared? |
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| **GOAL: GIS/RS Technical Competence** | | | | |
| TC1. Manage (create, edit, convert, filter, document) raster and vector GIS data in various formats. | Final Project, Course Assessment Question | Students will provide evidence of identifying and acquiring multiple data sources relevant to their project goals, perform appropriate editing, conversion and filtering tasks, and properly document their data and processing steps. | All graduating students final projects involved synthesis of raster and vector data. Three of five students incorporated field work for data collection. These projects demonstrated a strong ability to acquire, utilize and document data appropriately.<br><br>In the Fall 2019 Lidar final exam, students were asked to compare and contrast .las cloud data with traditional vector and raster formats. Based on an assessment of 15 graduate students, the average response rated a 4.56 out of 5 or significant to superior understanding of the concept. | Results were compiled by the PSM Director with final report/presentation assessments performed in consultation with Dr. Kronenfeld.<br><br>Lidar exam results were evaluated by Dr. Viertel. |
| TC2. Symbolize data & construct map products that effectively communicate information. | Final Project | Students will present thematic maps that effectively communicate the data and analysis results of their final project. Maps will be self-explanatory, with a clear message and intuitive symbolization that is appropriate to the data being presented. | All graduating students final projects included a number of maps effectively communicating research. Two of the students incorporated Arc "Story Maps" which narratively illustrate a history by animating a series of map movements accompanied by descriptive text. This work was done in cooperation with Coles Country Regional Planning. | Results were compiled by the PSM Director with final report/presentation assessments performed in consultation with Dr. Kronenfeld. |

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| TC3. Design structures and procedures to support GIS data collection, management and analysis. | Final Project | Students will demonstrate the ability to construct relational geodatabases, procedural geoprocessing models and/or python scripts to accomplish specific, documented GIS data compilation, processing or analysis tasks. | Student final projects each incorporate significant workflow design and demonstrated the ability to adapt to changing circumstances as the project progressed. A majority of students were forced to make changes to their initial analysis methodology based on a developing situation (in at least two cases this was COVID limiting data collection opportunities). | Results were compiled by the PSM Director with final report/presentation assessments performed in consultation with Dr. Kronenfeld. |
| **GOAL: Spatial Analysis** | | | | |
| SA1. Derive higher level spatial information from raw survey, GPS, satellite and other sensor data sources | Final Project, Internship Report | Students will demonstrate the ability to identify and classify features from aerial photographs, satellite images, field surveys and other data collection methods. | Three out of four students collected data in the field incorporating GPS and aerial/satellite data. All students performed further statistical analysis on their datasets. Their ability to apply analytical skills to appropriate data sets was strong.<br><br>All students used spatial information and tools to plan surveys, collect data, and transform raw values into usable products during their internship. | Results were compiled by the PSM Director with final report/presentation assessments performed in consultation with Dr. Kronenfeld. |
| SA2. Measure and describe various types of spatial pattern in geographic features | Final Project, Internship Report | Students will be able to identify and describe patterns of clustering, spatial correlation and co-location at different scales of analysis. | Two of five projects produced by graduating students did an excellent job in portraying spatial distance and clustering. Other projects involved a higher degree of straightforward mapping or historical documentation of location.<br><br>Students at internships demonstrated excellent use of spatial pattern analysis, using tools such as hillshading and field sampling to spot clusters of data. | Results were compiled by the PSM Director with final report/presentation assessments performed in consultation with Dr. Kronenfeld. |

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| SA3. Identify and assess causal relations between geographic phenomenon | Final Project, Internship Report | Students will be able to perform and interpret statistical tests of spatial pattern, such as geographically weighted regression, Ripley's K-function and co-location quotients. | Two of five students incorporated spatial statistics into their final projects. These techniques were used in appropriate and productive ways.<br><br>Student internships this past year were more heavily weighted towards data collection and visualization. The employers were not looking for spatial statistical information. | Results were compiled by the PSM Director with final report/presentation assessments performed in consultation with Dr. Kronenfeld. |
| **GOAL: Professional Skills and Knowledge** | | | | |
| PSK1. Define spatial problems, research questions and professional project goals | Final Project, Internship Report, Classroom Assessments | Students will clearly define the scope and objectives of their experience, including spatial data and analysis requirements. | Students demonstrated a greater focus on relating their final project and internship work to specific organizational goals. This has been one of the main goals of the one hour seminar class we have instituted for all PSM students.<br><br>Additionally, students in the Fall 2019 Lidar class were assessed on their final project, based on their communication in written and oral formats. Written papers achieved an average of 4.27/5 for the 15 students evaluated. Oral presentations achieved a 4.68/5 as an average. This suggested a significant to superior ability to define and communicate project goals and research questions. | Results were compiled by the PSM Director with final report/presentation assessments performed in consultation with Dr. Kronenfeld.<br><br>Dr. Viertel evaluated student projects and presentation in the Lidar course. |

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| PSK2. Place GIS projects within organizational context and justify their effort & expense | Internship Report | Students will be able to explain how their internship project benefits the organization and discuss limitations in terms of spatial data quality, time and available resources. | Students interning this year demonstrated a better scope and understanding of their project's context than past years. The focused placed on understanding the "big picture" in the one hour seminar class seems to be paying off. Additionally, work with the county or state for three of our interns help demonstrate the limitations and scope of project budgets. | Results were compiled by the PSM Director with final report/presentation assessments performed in consultation with Dr. Kronenfeld. |
| PSK3. Discuss emerging trends in GIS-related technology, regulations, standards and norms and their effects on society | Final Project | Students will demonstrate an understanding of the roles of emerging web technologies, open source software and volunteered geographic information in today's GIS industry, and be able to discuss the need for spatial data infrastructure and controversies regarding spatial data privacy. | Our graduating students final project presentations illustrated a strong understanding of norms and standards in geospatial technologies. Emerging trends were frequently cited. Credit for this understanding of cutting-edge technology may be, at least in part, attributed to the "Topics and Trends" class taught in the Spring of 2018 in which many of these students took part. This is being considered as a permanent addition to the curriculum. | Results were compiled by the PSM Director with final report/presentation assessments performed in consultation with Dr. Kronenfeld. |

**PART TWO**

| Describe your program's assessment accomplishments since your last report was submitted. Discuss ways in which you have responded to the CASA Director's comments on last year's report or simply describe what assessment work was initiated, continued, or completed. |
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Since last year's assessment we have instituted several changes in assessment and are proceeding on curriculum revision this Fall. One of the suggestions taken to heart was the need to broaden our assessment beyond simply summative measures to more formative types of evaluation. This resulted in the institution of class-based assessment on a semester basis. We chose to tackle this in a similar manner to our undergraduate assessment, embedding questions intended to elicit synthesis and context on select final exams. Individual student issues and challenges can be spotted and addressed in consultation at the end of each semester.

Additionally, we have elected to evaluate our graduate students on standardized written and oral rubrics when semester projects are used in class. Again, these were borrowed from our undergraduate program and can be refined in future years to better meet the graduate learning goals. Implementation began in Fall 2019, but was slowed by one of the two main faculty members (Dr. Kronenfeld) being on sabbatical. Additionally, the move to online mid-semester in Spring 2020 impacted the evaluation of these goals for Spring classes (preempting presentations, etc.). Regardless, the emphasis of these evaluations on communication seems to fit well with the revisions to graduate learning goals that are in process. We decided to report them as they applied to content this year, and wait to see the final draft before we add new measures to our three main goals.

Beyond student evaluation, we had the opportunity for a professional from the intelligence industry to teach a class on our behalf last Spring (which will be repeated again this Spring). In addition to contributing an outside perspective to our students, he gave the coordinator feedback on the preparation and performance of our students as well as how our curriculum aligns with industry and professional expectations. This valuable input is being incorporated into the aforementioned curriculum revisions.

Finally, we intend to continue our alumni survey, though at a period of three or four years based on suggestions from last-year's assessment. Given the small overall population of graduates, obtaining a useful survey sample on a yearly basis may not be practical. However, as the program grows, we can lessen this interval to be more responsive. As an added benefit, reconnecting with students in the alumni survey led to three of those students holding a remote talk about the industry and essential professional skills for our new PSM students this Fall.

## PART THREE

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?

Several concrete changes have emerged in the program based on the feedback we have received and evaluation of students. The one-hour seminar course continues and will soon be placed on the books as a permanent part of the program. We have sharpened the focus from an overall exploration of the field to concentrate on research skills and professionalism. The guided article critiques and literature reviews students conduct their first semester have paid dividends in terms of seeing better quality writing and analysis in later classes.

The lidar course offered twice in the past five years is currently in the proposal process at CGS (it has cleared the department and CLAS). Along with Geospatial Intelligence being offered a second time this coming Spring, it will be proposed as a permanent addition to the curriculum.

Feedback showing the introductory GIS course to be somewhat redundant at the graduate level has led to current discussions of removing this in favor of more advanced courses. Instead we would require a prior class or work experience in GIS for full program admission to the program, allowing students to be provisionally admitted with the expectation they take an undergraduate GIS course their first semester if they have no prior experience. This would allow the vast majority of students to go straight into essential courses such as GIS Programming their first year.

Our cartography and land use planning courses are being revised to qualify for graduate credit, allowing a broader selection of electives for our students, and lowering our reliance on Special Topics courses. An effort is being made to appeal to more faculty in the department to support and work with PSM students, to broaden their perspective beyond Dr. Kronenfeld, Dr. Laingen, and Dr. Viertel.

Planning for the future, we intend to spread evaluation into more individual courses, allowing near real-time feedback on student ability. We will work to overhaul the current learning goals and add to them in light of the new Graduate Learning Goals being adopted. The curriculum overhaul should be in place next year, allowing for a more streamlined, accessible path for graduate students, particularly part-time students. Finally, more of our curriculum will be taught online or in a hybrid format to respond to student preferences and necessities.

Assessment has played a crucial role in the many changes to this degree over the past few years. Assessing abilities and experiences helps the PSM in GIScience meet our students where they are now, providing opportunities both for their growth and the growth of the program as a whole.

## APPENDIX A

**Geography Program**
**Paper Assessment Evaluation**

**Student:** **Semester:**
**Topic:** **Course:**

**Length/Formatting:**
Length and formatting (font/margins) appropriate

5 4 3 2 1 0

**Organization:**
Ideas clearly organized, use of intro/conclusion, material flows

5 4 3 2 1 0

**Critical Thinking:**
Proper support of arguments, analysis of concepts and theory

5 4 3 2 1 0

**Information Presented:**
Facts understandable, accurate, and assignment relates to class/geography

5 4 3 2 1 0

**Language (Style and Grammar):**
Appropriate tense, proper language, relevant punctuation

5 4 3 2 1 0

**Graphics:**
Effective use of graphical materials, maps, charts and other visual devices

5 4 3 2 1 0

**Citations:**
Proper use of reference, parenthetical citation or footnotes, etc.

5 4 3 2 1 0

**Overall Grade:**
5 4 3 2 1 0

**Comments:**

***5 The student demonstrates a superior ability in written communication***
***4 The student demonstrates a significant ability in written communication***
***3 The student demonstrates a satisfactory ability in written communication***
***2 The student demonstrates a less than satisfactory in written communication***
***1 The student demonstrates no discernible ability in written communication***

## APPENDIX B

**Geography Program**
**Speech Assessment Evaluation**

**Presenter:** **Semester:**
**Topic:** **Course:**

**Time of Presentation:**
Time requirements met by the student.

5 4 3 2 1 0

**Presentation Organization:**
Ideas clearly organized, presenter prepared, flow of presentation

5 4 3 2 1 0

**Information Presented:**
Understandable, accurate, assignment relates to class/geography

5 4 3 2 1 0

**Presentation Style:**
Language used, articulate, eye contact, use of notes, pitch, free of fillers, professionalism

5 4 3 2 1 0

**Graphics:**
Use of visual aids ex: (maps, graphs, pictures, charts)

5 4 3 2 1 0

**Overall Grade:**

5 4 3 2 1 0

***5 The student demonstrates a superior ability to communicate research ideas***
***4 The student demonstrates a significant ability to communicate research ideas***
***3 The student demonstrates a satisfactory ability to communicate research ideas***
***2 The student demonstrates a less than satisfactory ability to communicate research***
***1 The student demonstrates no discernible ability to communicate research***

**Student Learning Assessment Program**
**Response to Summary Form**
**Graduate Program 2020**
May 5, 2021

Department: **Geology and Geography**

Degree and Program Name: Professional Science Master's in Geographic Information Science
Reviewer: Dr. Nikki Hillier, Graduate Assessment Coordinator, Graduate School

| Category | Comments |
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| **Learning Objectives** | The objectives for the program align with program goals, but only tangentially align with the graduate learning goals established by EIU's Council on Graduate Studies. While students' ability to communicate verbally and advanced scholarship is likely assessed, it is not an explicit expectation. |
| **How, Where, and When Assessed** | Students are assessed using a variety of methods: internship reports, projects, alumni surveys, and class assignments such as presentations, projects, and exam questions. |
| **Expectations** | Expectations are included and rubrics were submitted, but the expectations could be clarified. It would be helpful to set an expectation for an average score on the rubrics or what percent of students are expected to meet or exceed expectations. We can provide examples if that would be useful to your program. |
| **Results** | The report describes student performance as significant, superior, and strong. |
| **How Results Will be Used** | The report reflects how performance is determined (in consultation) but does not clearly describe how the results are used. Some programs use the results to highlight areas in the curriculum that need to be addressed or to identify students who need more support in meeting program expectations. |
| **Recommendations** | You have clearly taken action to make significant improvements to your plan based on feedback received from your previous report. Your program has a variety of methods for assessing student learning goals. The assessment plan includes standardized rubrics for specific assignments, as well as opportunities for evaluation through projects, presentations, and internships. We recommend continuing the work you are doing. We also recommend delineating the learning goals to more clearly align with the CGS learning goals. It would also be helpful to include expectations for the program overall, specifying what percent of students will meet expectations and exceed expectations in order to evaluate the program. That would make it easier to use the results from the assessment to make changes to the program as well. You have made real improvements to the plan, and it shows. |

The Council on Graduate Studies approved of revised learning goals on December 8, 2020, which included the addition of an Ethical and Professional Responsibility learning goal. Please consult with your graduate faculty members to determine how to incorporate this learning goal into future assessment activities.