## Student Learning Outcomes Assessment

**Department: Geosciences BS Geology all tracks**

### Objective: To develop skills of critical thinking and mathematical application to interpret data, draw conclusions, and solve problems within the context of the geosciences. This component is not a specific Geology SLOA Objective, but could be scattered across several objectives. (It is, however, most closely aligned with Objective #1.)

### Objective #1:

**Quantitative Reasoning:**

- **Direct Measure (DM):**
  - Embedded questions on exams in required GEOS courses (*): Class exercises (lab exercises, homework assignments, quizzes) (*); Specific allied courses that have some components that address this objective.
  - Geology field camp rankings (**).
- **DM Results:**
  - The total percentage of Geology students successfully accomplishing measures of this objective is 76.9%. Data is over several years and from numerous required courses. Please see summary of courses assessed at the end of this document. Trends (overall or course-specific or measure-specific) are difficult to discern, with myriad variables accounting for differences or changes.
  - Four Geology students attended geology field camp in 2018. Inquiries for student rankings were sent to each host institution, with 4 students being ranked. Our students ranked 15th and 21st out of 23 (SUNY-Cortland), and 16th and 17th out of 19 (Eastern Washington (EWU)). The SUNY-C field camp director stated that while our students performed very well on some aspects (sed/strat, simpler projects early in camp) they struggled with others (mapping of complex metam rocks, burn-out). The EWU field camp director indicated that all students attending in 2018 were of high-quality and scores didn’t vary. Thus, the rankings are very misleading. He welcomes future EU geology students to EWU’s camp.

### Indirect Measure (IM):

- **Student exit survey (**):** and Alumni survey (**^)** results and comments.

### Indirect Measure (IM):

- **Student Exit and Alumni survey results (!) from 2014 to 2015 (’14-15), 2016 (’16) and 2017 (’17) as well as Alumni survey results from 2018 (’18) and 2019 (’19)(which contains responses from 2018 graduates) contain responses to aspects of Quantitative Reasoning skills. Two questions on each survey specifically address aspects of this objective. Responses are from a composite of all Geosciences graduates and alumni, and not specifically those with a Geology degree.

- **Student Exit survey results addressed the following questions:** How well were you prepared in terms of a) data collection and manipulation, and b) quantitative skills? Responses of 4 (more than adequate) and 5 (very well) combined are given below. Results for (a) are 85.7%, 88.9%, and 88.5%; and results for (b) are 100.0%, 100.0, and 88.0%.

- **Alumni survey results addressed the following questions:** How well were you prepared in terms of a) data collection and manipulation, and b) quantitative skills? Responses of 4 (more than adequate) and 5 (very well) combined are given below. The first number is a composite of responses from ’14 to ’17, whereas the second and third numbers are from ’18 and ’19, respectively. Results for (a) are 73.3%, 67.5%, and 87.9%; and results for (b) are 61.8%, 60.5%, and 87.5%.

### Impressions:

- This is our first attempt to assess student Quantitative Reasoning skills specifically. It most reasonably aligns

- Students, from early stages to late, and across the curriculum, show a high level of success developing Quantitative Reasoning skills. With that said, development of more and better instruments to specifically measure student success with respect to quantitative skills is still necessary. Trends within specific courses can be attributed to several variables: concerted focus of

- Two questions on both Student Exit and Alumni surveys specifically address aspects of this objective.

- Overall, graduating students as well as alumni indicate that their educational experience more than adequately developed their Quantitative Reasoning skills. In general, satisfaction with quantitative skills development dropped for alumni.
with SLO Objective #1. Thus, we will treat it as essentially a subset of that objective.

We have clear but incomplete ways to measure student success with respect to developing Quantitative Reasoning skills. Gauging success is somewhat restricted by limited data, with several actions used and but only some measured.

<table>
<thead>
<tr>
<th>Limitations and Strengths</th>
<th>Faculty expertise and training are aligned with accomplishing this objective.</th>
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<tbody>
<tr>
<td>Small number of Geology faculty (4 full-time, tenured faculty, with 1 currently serving as Dept. Chair, and 1 regular part-time faculty) to cover wide breadth and depth of competency and skill development in the discipline.</td>
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**Proposed Action Item: Assessment Tool**

1. To evaluate GEOS course activities and embedded questions to address better the building, measuring and assessing student Quantitative Reasoning skills. We have numerous instruments to measure but incomplete data acquisition.
2. To create and embed more focused questions specific to this objective into both Student Exit and Alumni surveys.
3. To separate responses for different majors within Geosciences. We are still working on how to do this!

**Proposed Action Item: Program Content and Course Assessment Practices**

1. Continue to test-drive our new BS Geology programs and remedy potential issues that may appear. These programs came onboard in the 2018 fall.
2. Consider developing new course offerings that contain substantial components related to developing competencies and skills of analysis, synthesis, critical thinking and problem solving. Possibilities include Earth Systems, Surface Hydrology, and/or Quantitative / Computational Geology.

**Action Items Implemented**

Successful implementation of new BS Geology curricula (Traditional Geology track and Environmental Geology track), which now has 1) fundamental required and elective specialty course offerings better suited for each of the BS Geology tracks, 2) options for high-impact capstone research course and/or internship experience, and 3) math requirements better aligned with prospective post-graduate plans.

Examination specifically of Quantitative Reasoning skills.

Student Exit and Alumni surveys are now available electronically, with little effect however on improving low response rates. Response rates must be increased. Also, electronic survey results currently do not distinguish between different majors within Geosciences. They should.
Next year, we will assess **Objective #4: To become technologically proficient by using basic computer software.**

Notes:

(*) These measures are assessed in selected upper level geology courses. Data are gathered every time the course is offered, with every Geology major being assessed. The criterion used to measure performance is a scoring scale (proficiency ≥70%).

(**) This measure is assessed by examining GEOS 581 – Geology Field Camp course grade and/or, when available, performance ranking with respect to other field camp attendees. Data are gathered on all Geology majors who attend field camp and collected every summer.

(#) For perspective, consider: a) a majority of students attending field camp are typically from the host institution, which favors those students and not those from EU; and b) EU students merely need to pass for the credits to transfer, which provides little incentive to excel. Yet, they typically do excel. Host institutions for 2017 field camps were South Dakota SM&T (3 students), SUNY-Cortland (2), and Illinois State (1).

(^) Instructions to access Exit surveys online are distributed in selected upper level Geology courses to all Geology majors who file intent to graduate. Surveys are submitted electronically near the conclusion of fall and spring semesters and a scoring scale is used to assess performance. Note that this is a new procedure where students file electronic surveys rather than hand in paper copies of surveys.

(^)^ Data are collected every year and gathered via traditional and electronic mailing, where instructions to access Alumni surveys online are (e)mailed to all Geology majors on 5-year and 10-year graduation anniversaries. This year, instructions were mailed twice in an attempt to increase response rates. A scoring scale is used to assess performance. Note that this is a new procedure where alumni submit electronic surveys rather than send in paper copies of surveys.

(!) Although the surveys are available electronically and submitted online, response rates are still frustratingly low. Additional efforts are needed to bolster those response rates.
Program: BA Environmental Studies

<table>
<thead>
<tr>
<th>Year</th>
<th>Objective</th>
<th>Direct Measure (DM)</th>
<th>DM Results</th>
<th>Indirect Measure (IM)</th>
<th>IM Results</th>
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</table>
| 2019 | Objective 1. Core knowledge of human and physical systems and the natural world. | Competencies assessed in:  
A. GEOG320 Physical Geography (N=14 students)  
1a – specific exam questions from two exams (max 2.5 points)  
1b – specific exam questions from three exams (max 52 points)  
1c – specific exam questions from two exams (max 15 points)  
B. GEOG425 Geog. of Water Resources (N=10 students)  
1a - written assignment, to discuss/critique specific data maps from water atlas.  
1b - specific questions from two different written assignments. The first assesses understanding of the concepts of ‘global hydrologic cycle’, ‘watershed’, and ‘water budget equations’ (max. 15 points). The second requires development of and discussion of a list of 20 ‘most important’ concepts from the course and subtopics within each. | A.1a. 10 of 14 students achieved C or better outcome (9 of 14, B or better).  
A.1b. 10 of 14 students achieved C or better outcome (6 of 14, B or better).  
A.1c. 9 of 14 students achieved C or better outcome (9 of 14, B or better). | | |
<table>
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<tr>
<th>Impression</th>
<th>Physical geography is a survey course that covers a wide range of materials. This is reflected in the nature of lost points on tests, where students are not consistently missing the same questions.</th>
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<tbody>
<tr>
<td>Limitations</td>
<td>Students in GEOG 320 may be sophomores, juniors, or seniors leading some students to have familiarity with topics and concepts from other related courses. Total class size is 28 students, with the remainder of unassessed students typically taking coursework toward a Geography Minor. Some students will have already completed or are concurrently taking GEOS 101 Dynamic Earth, GEOS 320 Meteorology, GEOG 305 Cartography, or some other environmental courses. (Students in GEOG 425 and GEOG 515 are typically juniors or seniors, and the majority of student in the course are Environmental Studies majors.)</td>
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<tr>
<td>Proposed Action Item: Assessment Tool</td>
<td>Develop and refine direct assessment measures associated with objective 1 for GEOG 320, GEOG 425, and GEOG 515. GEOG 320 is a foundational geography course required of all students completing the GIS major, the Environmental Studies major, and the Geography minor.</td>
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<tr>
<td>Proposed Action Item: Program Content and</td>
<td>Develop and refine direct assessment measures associated with objective 1 for other required and elective upper-level GEOG courses in order to assess learning outcomes in a number of environmental geography subfields.</td>
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Revised Learning Objectives and General Competencies for the B.A. Environmental Studies Program:

1. Core knowledge of human and physical systems and the natural world.
   a. Understand fundamental geographical concepts, including scale, region, location, place, distance, distribution, pattern, and process.
   b. Master key terms and concepts associated with environmental geography.
   c. Describe spatial patterns of human and physical systems and the natural world.
   d. Understand the nature and history of human impacts to the environment.

2. Core knowledge of geospatial and natural science technologies and techniques.
   a. Demonstrate skill in the use of natural science technologies and techniques common to the environmental sciences.
   b. Demonstrate skill in the use of GIS (Geographic Information Systems) techniques and technology.
   c. Master spatial analytic processes and decision-making, including map interpretation and use.

3. Acquire and hone intellectual and practical skills necessary to succeed as an environmental professional.
   a. Demonstrate information literacy.
   b. Develop excellent oral and written communication.
   c. Demonstrate quantitative literacy and data management proficiency.
   d. Demonstrate spatial literacy.

4. Develop capacity for integration and synthesis with respect to environmental and geographical opportunities and problems.
   a. Develop analytical and critical thinking skills.
   b. Propose solutions for complex environmental problems by integrating core knowledge (objectives 1 & 2) and intellectual/practical skills (objective 3).
   c. Participate effectively as a team member and a team leader.

5. Acquire the foundation and skills necessary to promote lifelong learning and engaged citizenship.
a. Demonstrate civic knowledge and engagement – local and global.
b. Appreciate how culture and experience influence people’s perceptions of places and regions.
c. Recognize that personal and social responsibility are associated with understanding environmental issues.
d. Develop ethical reasoning and action.

Program: Geographic Information Science (GIS)
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<tr>
<th>2019</th>
<th>Objective 1. Develop core knowledge of human and physical systems and the natural world.</th>
<th>All 4 competencies were assessed in GEOG 320 Physical Geography (N=4 students)</th>
<th>1a. all 4 students achieved an A outcome.</th>
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<td>Competencies:</td>
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<td>1b. 3 of 4 students achieved C or better outcome (2 of 4, B or better).</td>
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<td></td>
<td>e. Concepts of scale, region, location, place, distance, distribution, diffusion.</td>
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<td>1c. 3 of 4 students achieved B or better outcome. (same for C or better)</td>
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<td></td>
<td>f. Mastery of key terms and concepts associated with geography subfields</td>
<td></td>
<td>1d. 3 of 4 students achieved C or better outcome (2 of 4, B or better).</td>
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<td>g. Spatial patterns of human and physical systems and the natural world</td>
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<td></td>
<td>h. Core knowledge of human and physical processes and the natural world</td>
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<td></td>
<td>All 4 competencies</td>
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Impression  
This small sample suggests that students in the GIS major tend toward greater competencies with spatial patterns and concepts than mastery of earth science terms, concepts and knowledge.

Limitations  
Sample size is very small. GIS (Geographic Information Science) is a new major program that we anticipate will grow with time. Splitting the former geography major into two distinct programs (GIS and Environmental Studies) has reduced sample sizes for student learning outcome assessment.

Proposed Action Item: Assessment Tool  
Develop and refine direct assessment measures associated with objective 1 for GEOG 320. GEOG 320 is a foundational geography course required of all students completing the GIS major, the Environmental Studies major, and the Geography minor.

Proposed Action Item: Program Content and Course Assessment Practices  
Develop and refine direct assessment measures associated with objective 1 for other required, upper-level courses in order to assess learning outcomes in a number of geography subfields. Future assessments will occur in GEOG 335 Urban Geography and GEOG 545 Environmental Planning, as well as GEOG 320.

Action Items Implemented  
NEW learning objectives and competencies for B.A. GIS were developed (see new objectives, below). Objective competencies were mapped onto upper-level courses to be assessed.

Objective to be Assessed Next Year  
Objective 2 (see learning objectives with competencies, below) – core knowledge of geospatial technologies and techniques, and the study of spatial phenomena.

Learning Objectives and General Competencies for the NEW B.A. Geographic Information Science Program:
6. Core knowledge of human and physical systems and the natural world.
   a. Understand fundamental geographical concepts, including scale, region, location, place, distance, distribution, pattern, and process.
   b. Master key terms and concepts associated with geography subfields.
   c. Describe spatial patterns of human and physical systems and the natural world.
   d. Acquire core knowledge of human and physical processes and the natural world.

7. Core knowledge of geospatial technologies and techniques, and the study of spatial phenomena.
   a. History and components of GIS (geographic information systems)
   b. Knowledge of and skill in the use of techniques and technology common to the discipline.
   c. Spatial analytic processes and decision-making including map interpretation and use.
   d. Geographic visualization and imagination.

8. Acquire and hone intellectual and practical skills necessary to succeed as a professional in geography and related fields.
   a. Geographic information literacy.
   b. Oral and written communication.
   c. Quantitative literacy and data management.
   d. Time management.

9. Develop capacity for integration and synthesis with respect to environmental and geographical opportunities and problems.
   a. Develop analytical and critical thinking skills.
   b. Synthesis and advanced accomplishment, building on acquired geographical knowledge and skills.
   c. Participate effectively as a team member and a team leader.