Master of Science, Applied Geological Sciences

Academic Assessment Plan

Adopted by

The Department of Geological Sciences faculty: 11/30/2016

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for review by
The Academic Assessment Committee of the Faculty Senate

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MISSION STATEMENT

The Department seeks to provide the highest quality of education through a learning environment that enables and inspires students to succeed academically and professionally, provides the highest quality instruction, fosters research and other creative activities, and instills a desire to embrace life-long learning.

PROGRAM INTRODUCTION

The Geological Sciences Program falls within the College of Arts and Sciences at University of Alaska Anchorage. The Master of Science in Applied Geological Sciences (MSAGS) program prepares students for work in a multitude of careers that require a deep and broad foundation in the geological sciences. These include careers in environmental geosciences, the oil and gas industry, minerals and mining, and state and federal agencies. A master's degree in applied geological sciences implies not only an enhanced level of understanding of the fundamentals of geological sciences, but also an applied skillset that allows students to apply advanced concepts of geological sciences to problem-solving.

The MSAGS has a thesis and a non-thesis option. The thesis option includes a focus on skills related to the acquisition of new knowledge and is designed for students who wish to pursue higher entry level positions into jobs or to eventually pursue a Ph.D. degree. The non-thesis option is designed for students who wish to further emphasize applied geological sciences and prefer to substitute additional classroom education and a comprehensive written exam or a project and comprehensive oral exam for graduate research experience.

ASSESSMENT PROCESS INTRODUCTION

The Geological Sciences faculty have adopted three Program Objectives and five Student Learning Outcomes for the MSAGS degree. Outcome assessment and implementation of continuous improvement is the responsibility of the faculty of the Geological Sciences (GS) Program.

The outcomes assessment strategy of the GS Program is voted upon by the GS faculty. The faculty select the measures that will be used to assess each outcome. Individual faculty members agree to implement recommendations from peers on a volunteer basis. Among other duties, the Director of the Department keeps central records of all assessment activities, prepares reports, and coordinates with the Dean of CAS.

PROGRAM OBJECTIVES AND STUDENT LEARNING OUTCOMES

Program Objectives

The UAA applied geological sciences graduate program objectives are to provide graduates with:

1. Graduate-level technical knowledge within geological sciences.
2. An ability to conceive and conduct graduate-level geological sciences research (thesis option only) and problem solving.
3. An ability to effectively communicate and apply graduate-level geological sciences concepts and technical skills.

Student Learning Outcomes

In keeping with the above objectives, the expected student learning outcomes of the UAA MSAGS program include an ability to:

1. Use rigorous methods of scientific analysis.
2. Demonstrate mastery of graduate-level geological sciences theory.
3. Conduct advanced geological sciences research and/or demonstrate technical skill application.
4. Apply the scientific method to graduate-level problems in one or more focus areas of geological sciences.
5. Work effectively within the professional framework of geological sciences careers or be prepared for Ph.D. research programs.

TABLE 1: ASSOCIATION OF ASSESSMENT MEASURES TO STUDENT LEARNING OUTCOMES

Outcomes	Direct CLA	Exit Survey	Comp. Exam	Project or Thesis
1. Use rigorous methods of scientific analysis	**1**	**1**	**1**	**1**
2. Demonstrate mastery of graduate-level geological sciences theory.	**1**	**1**	**1**	**1**
3. Conduct advanced geological sciences research and/or demonstrate technical skills application.	**0**	**1**	**0**	**1**
4. Ability to apply the scientific method to graduate-level problems in one or more focus areas of geological sciences	**1**	**1**	**0**	**1**
5. Work effectively within the professional framework of geological sciences careers or be prepared for Ph.D. research programs.	**0**	**1**	**0**	**1**

0 = Measure is not used to measure the associated outcome.
1 = Measure is used to measure the associated outcome.

ASSESSMENT MEASURES

A description of the measures used in the assessment of the student learning outcomes and their implementation are summarized in Table 2 below. The measures and their relationships to the student learning outcomes are listed in Table 1, above.

There is a separate appendix for each measure that shows the measure itself and describes its use and the factors that affect the results.

TABLE 2: ASSESSMENT MEASURES AND ADMINISTRATION

Measure	Description	Frequency/ Start Date	Collection Method	Administered by
Direct Course Level Assessment	Graded student work from selected courses to measure the level of outcome achievement.	Spring and Fall semesters, beginning Fall 2017	Evaluation by course instructors	Course instructors
Exit Survey	Survey given to graduating students in which students self-assess their perceived level of outcome achievement.	Spring and Fall semesters, beginning Fall 2017	Surveys given by computer or hard copy	Graduate advisor
Thesis Defense/Comprehensive Exam	Student performance on comprehensive written or oral exam required for completion of the MSAGS degree. Project and thesis students take an oral exam as part of their defense, and non-thesis students may opt for a written exam instead of a project.	Spring and Fall semesters, beginning Fall 2017	Evaluation done by student's graduate committee	Graduate committee
Thesis or Project	Student performance on written document and oral presentation associated with project or thesis.	Spring and Fall semesters, beginning Fall 2017	Evaluation done by student's graduate committee	Graduate committee

ASSESSMENT PROCESS

General Implementation Strategy

The College of Arts and Sciences administration is responsible for:

- Providing sufficient financial and staff support for the implementation of this plan.
- Ensuring faculty assessment efforts are appropriately reflected in annual workload agreements.

The GS Program faculty are responsible for:

- Performing assessment as an integral part of teaching activity (course level assessment).
- Participating in meetings to discuss development and implementation of the assessment plan.
- Participating in meetings to discuss interpretation of the data and implementation of continuous improvement, particularly relating to the GS curriculum.

The Chair of the Department Curriculum and Assessment Committee is responsible for:

- Keeping central records of all assessment activities.
- Preparing reports related to assessment activities, subject to the approval of the GS faculty.
- Coordinating with the UAA Academic Assessment Committee.

The Director of the GS Department is responsible for:

- Presiding at GS faculty meetings in which assessment issues are discussed.
- Communicating the assessment-related activities and needs of the GS Department to the College of Arts and Sciences administration.

Of the four assessment measures used to assess the MSAGS Program, three will occur as students prepare to finish their degrees (exit survey, comprehensive exam, and thesis/project report). Assessment data will be taken on these three items for every student. Direct CLA will be carried out on a schedule that complements the already-existing assessment program for the BSGS degree.

The GS faculty operate on an assessment timeline wherein an assessment occurs every year. Assessment data will be used to prepare an Outcomes and Objectives Assessment Report for the BSGS degree that is ultimately reviewed by the Department Director and the Dean of CAS. At these times, assessment data from the MSAGS program will be gathered into the same report and assessed in parallel with the undergraduate program.

The first full round of assessment for the BSGS Program was completed in AY2016-17. The next round of assessment will be completed in AY2017-18. It is anticipated that the first round of assessment for the MSAGS will be completed in AY2019-20 when the core MSAGS courses have been implemented and the first MSAGS graduates complete their MS degree program.

Description of Faculty Involvement

The GS faculty are ultimately responsible for all aspects of the assessment process.

Development of assessment plans:

- Assessment plans are implemented following a vote of the GS faculty at a faculty meeting attended by a quorum.

Implementation of assessment measures:

- Course instructors of the assessed course collate examples of student work and perform preliminary analysis and interpretation before turning the data over to the Chair of the Department Curriculum and Assessment Committee.
- Other, additional assessment activities are encouraged, and are initiated by individual faculty members or special committees on a volunteer basis. The formation of special committees for the purpose of assessment is subject to a vote by the GS faculty. These individual faculty members of special committees are responsible for preliminary analysis and interpretation of the data.

Recommendations for continuous improvement:

- The Chair of the Department Curriculum and Assessment Committee prepares reports on the findings of assessment activities, which may contain analysis of the data and recommendations for continuous improvement. These reports are subject to the approval by the full GS faculty before adoption or dissemination.
- GS faculty member instructors may take action for continuous improvement within their own courses as suggested by the results of their assessment activities and the assessment activities of their colleagues.
- Recommendations for actions to be taken for continuous improvement at the Department level may be suggested by any GS faculty member, to be discussed at a GS faculty meeting. These suggestions may include:
    - Changes in course content, sequencing, or prerequisites.
    - Substitution, creation, or deletion of courses in the current curriculum.
    - Changes in instructor assignments.
    - Changes in advising methods.
    - Additions or replacement of equipment, such as lab equipment, vital to effective instruction or thesis research.

Modification of the Assessment Plan

Potential changes to the assessment plan may be suggested by any faculty member to be discussed at one of the regular faculty meetings. Changes to the assessment plan are implemented following a discussion and a vote at a faculty meeting at which a quorum (2/3 of full-time faculty) is present.

APPENDIX A: DIRECT COURSE LEVEL ASSESSMENT

Measure Description:

Course instructors will evaluate student work to measure the level of outcome achievement. Assessment tools may include quiz and exam questions, projects, laboratory reports or other writing assignments, in-class presentations, or other materials deemed appropriate by the instructor. Instructors may choose which assessment tool or tools they wish to use.

Factors that affect the collected data:

- Clarity of the assignment or question.
- Student motivation.
- Instructor bias in evaluating results.
- Instructor style with respect to grading.

How to interpret the data:

Instructors may choose one of two methods for assessing outcomes and/or individual performance indicators. Instructors may choose to assess student work based on one of the attached rubrics, or to examine student grades on exam questions or projects that relate to particular outcomes or performance indicators.

The procedure for direct CLA using one of the attached rubrics is as follows:

1. Rate each student according to one of the attached rubrics on a scale of "Excellent," "Satisfactory," "Developing," or "Unsatisfactory."
2. Determine the percentage of students who have shown "Satisfactory" or "Excellent" achievement of the outcome.

The procedure for direct CLA using student grades is as follows:

1. Choose a project or exam problem which relates directly to a particular outcome or performance indicator.
2. Determine the percentage of students whose grades put them in the categories of "Excellent," "Satisfactory," "Developing," or "Unsatisfactory."

These data will be used to suggest the effectiveness of courses within the MSAGS program, and will also be used by the course instructor to gauge student learning effectiveness at the course level. A sample Student Outcome Report for direct CLA is shown below. Rubrics for all Outcomes follow.

Outcome 1: an ability to use rigorous methods of scientific analysis				
Performance Indicator	**Poor**	**Developing**	**Satisfactory**	**Excellent**
1. Identifies appropriate tools for a given task	Does not demonstrate understanding of appropriate tools for a given task	Demonstrates limited understanding of appropriate tools for a given task	Demonstrates satisfactory understanding of appropriate tools for a given task	Demonstrates exceptional understanding of appropriate tools for a given task
2. Understands advantages and disadvantages of the chosen tool in relation to possible choices	Cannot describe advantages and disadvantages of a particular tool, or description is incorrect	Can provide limited description of advantages and disadvantages of a particular tool	Can provide satisfactory description of advantages and disadvantages of a particular tool	Provides exemplary description of advantages and disadvantages of a particular tool
3. Utilizes the tool using correct technique	Is unable to utilize the tool using correct technique	Ability to utilize the tool is limited	Utilizes the tool in a satisfactory manner	Demonstrates exceptional mastery of the correct technique for using the tool
4. Assesses the validity of the results of the analysis	Is unable to assess the validity of the results	Makes limited attempts to assess the validity of the results	Assesses the validity of the results in a satisfactory manner	Assesses the validity of the results in an exceptional manner

Outcome 2: an ability to demonstrate mastery of graduate-level geological sciences theory				
Performance Indicator	**Poor**	**Developing**	**Satisfactory**	**Excellent**
1. Selects appropriate theory, model or governing equation	Does not demonstrate understanding of appropriate theory	Demonstrates some idea of appropriate theory	Selects appropriate theory for the problem	Judgment exceeds expectations when selecting theory for problem
2. Understands simplifying assumptions or limitations of the chosen model	Does not demonstrate understanding of simplifying assumptions or limitations	Demonstrates incomplete understanding of simplifying assumptions or limitations	Demonstrates understanding of simplifying assumptions or limitations	Demonstrates particularly thorough understanding of limitations of model
3. Implements theory, model or governing equation correctly to perform analysis	Is unable to implement theory to perform analysis	Begins analysis but is unable to see it to completion	Implements theory correctly to perform analysis	Implements theory to perform analysis in a way that exceeds expectations

Outcome 3: an ability to conduct advanced geological sciences research and/or demonstrate technical skills application				
Performance Indicator	**Poor**	**Developing**	**Satisfactory**	**Excellent**
1. Demonstrates an understanding of the problem statement or technical skill application	Does not demonstrate understanding of the problem	Demonstrates limited understanding of the problem	Can explain the problem statement in a satisfactory manner	Demonstrates exceptional insight into the problem statement
2. Explains research or project in the context of current state of the art using a variety of references	Limited or no effort to explain work in context of current state of the art	Attempts to explain work in context of current state of the art but is unsuccessful	Explains work in context of current state of the art in a satisfactory manner	Demonstrates exceptional understanding of work in context of current state of the art
3. Provides appropriate data and analysis to address an identified geologic problem	In unable to provide data or analysis of the problem	Provides incomplete data or analyses to address the problem	Provides satisfactory data and analyses to address the problem	Provides data and analyses that exceed expectations
4. Assesses validity of conclusions based on insight from analog geologic systems or datasets	Makes no attempt to validate the solution/validation method incorrect	Makes limited attempts to validate the solution	Assesses the validity of the solution using an appropriate technique	Uses multiple techniques to assess validity of solution

Outcome 4: an ability to apply the scientific method to graduate-level problems in one or more focus areas				
Performance Indicator	**Poor**	**Developing**	**Satisfactory**	**Excellent**
1. Applies the scientific method to contribute understanding of specific scientific issue	Does not apply the scientific method, or the use of the scientific method is especially poor	Limited attempts to apply the scientific method	Demonstrates a reasonable use of the scientific method appropriate to the project	Shows exceptional use of the scientific method which exceeds expectations
2. Defines clear hypotheses and relevant hypothesis tests	Does not define hypotheses or relevant hypothesis tests	Attempts to define hypotheses and relevant hypothesis tests, but they are unclear	Defines clear hypotheses and relevant hypothesis tests appropriate to the project	Defines exceptionally clear hypotheses and relevant hypothesis tests
3. Creates a final product for evaluation	Does not create a final product, or the final product is especially poor	Makes a start on a final product but is unable to defend all aspects of the project	Creates a satisfactory final product and can defend all aspects of the project	Creates an exceptional final product and the defense of the project exceeds expectations
4. Evaluates aspects of the design	No appropriate application of the scientific method	Limited application of the scientific method	Satisfactory application of the scientific method	Exemplary applicatio of the scientific method

Outcome 5: an ability to work effectively within the professional framework of geological sciences careers or be prepared for Ph.D. research programs				
Performance Indicator	**Poor**	**Developing**	**Satisfactory**	**Excellent**
1. Communicates with committee and other colleagues in a clear, professional, and timely manner	Does not communicate, or communicates sporadically and/or unprofessionally	Attempts at professional communication are uneven	Communicates to a satisfactory level	Demonstrates exceptional effort at communication
2. Offers and accepts constructive criticism	Ignores or takes offense to constructive criticism; offers criticism unconstructively	Limited ability to accept criticism; limited ability to offer constructive criticism	Offers and accepts constructive criticism	Exceeds expectations when offering and accepting constructive criticism
3. Participates in a community of professionals	Does not interface with other professionals	Limited participation in a community of professionals	Participates in professional development/ networking activities	Exceptional level of participation in community of professionals

Student Outcome Report for Course Instructor: Outcome 2

Course title:	Geol A490/690	Instructor:	Aschoff
Number of students:	10	Semester:	Fall 2014

Assessment Rubric:

Outcome 2: an ability to demonstrate graduate-level geological sciences theory				
Performance Indicator	**Performance Indicator**	**Performance Indicator**	**Performance Indicator**	**Performance Indicator**
1. Selects appropriate theory, or geologic model	Does not demonstrate understanding of appropriate model	Demonstrates some idea of appropriate model	Selects appropriate model or theory for the problem	Judgment exceeds expectations when selecting model for problem
2. Understands uncertainty, assumptions and limitations of the chosen geologic model	Does not demonstrate understanding of uncertainty, assumptions or limitations	Demonstrates incomplete understanding of uncertainty, assumptions or limitations	Demonstrates understanding of uncertainty, assumptions or limitations	Demonstrates particularly thorough understanding of geologic model
3. Communicates the theory or geologic model based on data	Is unable to implement theory or model to perform analysis	Begins analysis but is unable to see it to completion	Implements theory or model correctly to perform analysis	Implements theory or model to perform analysis in a way that exceeds expectations

Summary of results:

		Number of Students Achieving this Level				
PI	**Assessment method**	**Poor (1)**	**Developing (2)**	**Satisfactory (3)**	**Excellent (4)**	**% Students scoring 3 or 4**
1	Field Exercise	0	3	6	1	70%
2	Final/capstone Project	0	2	6	2	80%

Direct Assessment Action:
For PI 1, students were assigned a field exercise that required them to independently collect, analyze and integrate disparate geologic data to build a complex geologic interpretation and explain this in written form. They worked in groups of two, and their project reports were assessed. PI 2 involved assessment of the final/capstone, core-description project that required them to collect, analyze and integrate geologic data to build a complex geologic interpretation/model and present results in the form of a professional poster presented to the local community (consisting of scientists and general public).
Comments and Proposed Improvement:

APPENDIX B: EXIT SURVEY

Measure Description:

The Graduate Exit Survey is given to students about to receive their MSAGS degrees. This survey is a form of indirect assessment which asks students to rate both their own understanding of the student outcomes and the quality of the MSAGS program at delivering these Outcomes.

Factors that affect the collected data:

- Clarity of survey questions.
- Student bias in answering survey questions.
- Differing student perception of the terms "Poor," "Below Expectations," "Satisfactory," "Exceeds Expectations," and "No Opinion."

How to interpret the data:

As an indirect assessment method, self-assessment by students arguably is not as accurate a method of outcomes assessment as direct evaluation of student work. However, there is value in collecting feedback from students who have completed the degree program and are able to comment on the program in its entirety. It is valuable to ascertain whether a gap exists between student performance/preparedness and student perception of performance/preparedness. The data will be analyzed to show which aspects of the curriculum for which the students identify as having only a "Poor," "Fair" or "Good" understanding. Improvements in those areas can then be discussed by the Department Curriculum and Assessment Committee.

Department of Geological Sciences
UNIVERSITY of ALASKA ANCHORAGE

MSAGS Exit Survey 2018

General Information

The Geological Sciences Department implements an outcomes-based assessment program to enable continuous improvement of our MSAGS program. As part of this effort, we survey graduating students to get their feedback on our program. Your responses will help us determine how well we are doing and what we can do to better serve our students, alumni, and the geosciences community.

1. With what type of Master's degree will you be graduating?

- ◯ Thesis
- ◯ Non-thesis, professional project !
- ◯ Non-thesis, comprehensive exam !

2. In what capacity did you attend UAA while enrolled in the MSAGS program?

- ◯ Full-time, research assistantship
- ◯ Full-time, teaching assistantship
- ◯ Full-time, self-funded !
- ◯ Part-time, while working !
- ◯ Part-time, self-funded !
- ◯ Other – please add comments below !

3. If you completed a thesis or professional project, what was the area of emphasis?

- ◯ Applied Environmental Geology
- ◯ Applied Petroleum Geoscience
- ◯ Applied Mineral Resources
- ◯ Depositional Systems and/or Stratigraphy
- ◯ Geochemistry
- ◯ Geophysics or Petrophysics
- ◯ Hydrogeology
- ◯ Igneous Petrology, Metamorphic Petrology, or Geochronology
- ◯ Quaternary Geology, Glacial Geology, or Permafrost
- ◯ Planetary Geology
- ◯ Structural Geology

4. What is the next step in your career?

- ◯ I have accepted a permanent position (describe below)
- ◯ I will continue my current employment (describe below)
- ◯ I will continue my graduate education in a Ph.D. program (describe below)
- ◯ Do not know
- ◯ Comments

5. If you completed a thesis or project, what is its publication status?

- ◯ Submitted or published in a peer-reviewed journal
- ◯ Manuscript is being prepared for submission to a peer-reviewed journal
- ◯ Presented research at a conference !
- ◯ None of the above !

MSAGS Exit Survey 2018

Student Outcomes

The UAA MSAGS program has adopted several outcomes that we expect our students to achieve upon completion of the MSAGS degree. Please rate your own knowledge/skills in each of these areas, as well as the program's effectiveness in teaching you the knowledge/skills relative to each objective. Please feel free to use the space after the list to expand on any of your responses or for additional comments.

6. An ability to use rigorous methods of scientific analysis

	Poor	Below Expectations	Satisfactory	Exceeds Expectations	No Opinion
What was your ability before enrolling in the MSAGS program?	○	○	○	○	○
What is your ability now?	○	○	○	○	○
How well did the program do in teaching this skill?	○	○	○	○	○

7. An ability to demonstrate mastery of graduate-level geological sciences theory

	Poor	Below Expectations	Satisfactory	Exceeds Expectations	No Opinion
What was your ability before enrolling in the MSAGS program?	○	○	○	○	○
What is your ability now?	○	○	○	○	○
How well did the program do in teaching this skill?	○	○	○	○	○

8. An ability to conduct advanced geological sciences research and/or demonstrate technical skills application

	Poor	Below Expectations	Satisfactory	Exceeds Expectations	No Opinion
What was your ability before enrolling in the MSAGS program?	○	○	○	○	○
What is your ability now?	○	○	○	○	○
How well did the program do in teaching this skill?	○	○	○	○	○

9. An ability to apply the scientific method to graduate-level problems in one or more focus areas

	Poor	Below Expectations	Satisfactory	Exceeds Expectations	No Opinion
What was your ability before enrolling in the MSAGS program?	○	○	○	○	○
What is your ability now?	○	○	○	○	○
How well did the program do in teaching this skill?	○	○	○	○	○

10. An ability to work effectively within the professional framework of geological sciences careers or be prepared for Ph.D. research programs

	Poor	Below Expectations	Satisfactory	Exceeds Expectations	No Opinion
What was your ability before enrolling in the MSAGS program?	○	○	○	○	○
What is your ability now?	○	○	○	○	○
How well did the program do in teaching this skill?	○	○	○	○	○

11. Comments (if any) !

MSAGS Exit Survey 2018

Additional Information

12. Indicate your level of satisfaction with each of the following aspects of your experience as a graduate student at UAA. Feel free to include additional comments.

	Poor	Below Expectations	Satisfactory	Exceeds Expectations	No Opinion
Quality of Instruction	○	○	○	○	○
Quality of Advising/Mentoring	○	○	○	○	○
Quality of Facilities	○	○	○	○	○
Quality of Computing Resources	○	○	○	○	○
Quality of Graduate Students	○	○	○	○	○

Comments (if any)

13. List the main strengths of the MSAGS program at UAA.

14. List possible areas of improvement for the MSAGS program at UAA.

15. Would you recommend the MSAGS program to other prospective graduate students?

- ○ Yes
- ○ No
- ○ Unsure

APPENDIX C: THESIS DEFENSE/COMPREHENSIVE EXAM

Measure Description:

This measure uses student performance on the thesis defense or comprehensive exam required for completion of the MSAGS degree. Project and thesis students take an oral exam as part of their defense, and non-thesis students may opt for a written exam instead of a project. Comprehensive exams are set by each student's graduate committee according to his or her specific areas of study.

Factors that affect the collected data:

- Clarity of the questions from different committee members.
- Student motivation.
- Committee member bias in evaluating results.
- The fact that each student will have a different committee.

How to interpret the data:

Committee members will assess student performance on the appropriate outcomes using rubrics similar to those presented in Appendix A (Direct CLA) on a scale of "Excellent," "Satisfactory," "Developing," or "Unsatisfactory." These data will be used to suggest the effectiveness of the MSAGS degree program, in this case the coursework combined with committee advising.

APPENDIX D: THESIS OR PROJECT

Measure Description:

This measure examines student performance on a written document and oral presentation associated with the student's thesis or project. Assessment of both the written report and oral presentation are completed by the student's graduate committee.

Factors that affect the collected data:

- Clarity of the questions from different committee members.
- Student motivation.
- Committee member bias in evaluating results.
- The fact that each student will have a different committee.

How to interpret the data:

Committee members will assess both the written report and the oral presentation on the appropriate outcomes using rubrics similar to those presented in Appendix A (Direct CLA) on a scale of "Excellent," "Satisfactory," "Developing," or "Unsatisfactory." These data will be used to suggest the effectiveness of the MSAGS degree program, in this case the coursework combined with committee advising.