Introduction

This year, the Dept. of Geology & Geophysics SLOA committee elected to substantially revise our assessment plans in order to achieve the following objectives: 1) Create more uniform and streamlined assessments of undergraduate and graduate programs; 2) Collect data to guide revision of entry-level undergraduate courses; 3) Facilitate comparison of projects, papers and presentations created for different courses and instructors; 4) Improve exit surveys at all levels; and 5) Adhere more closely to the SLOA format. As a result, the current report focuses primarily on new or revised tools that will be used to collect data in subsequent years. New assessment rubrics and surveys are attached here as examples, but our plan is to make all of these available online in a self-compiling database and go paperless by the beginning of the fall semester. The plans and tools were discussed, revised and approved by the faculty during the annual retreat on May 17, 2012. In subsequent years, we will take time during the retreat to analyze the data collected for each program and discuss potential changes based on those data.

BS in Geoscience

We have devised seven tools to collect and compare data regarding student learning and skill acquisition throughout the BS program. These tools are described briefly below and attached at the end of this report.

• **Geoscience Concept Inventory**: Students taking 101 (Earth’s Dynamic Systems) and Geos 112 (Historical Geology), our introductory sequence for Geoscience majors, will take a pre-test and post-test at the beginning and end of each course, respectively, to assess misconceptions and measure learning gains or losses. The tests are based on the Geoscience Concept Inventory (GCI), a community instrument designed and tested by science educators ([http://geoscienceconceptinventory.wikispaces.com/home](http://geoscienceconceptinventory.wikispaces.com/home)). Beginning next year, students will be able to take the pre- and post-tests online, and data regarding common misconceptions and learning gains or losses across the two-semester sequence will be automatically compiled.

• **Field Camp Exit Survey**: “Field Camp” is an eight-week summer course in which students nearing completion of a Bachelor of Science degree in geology apply, refine, and expand their skills and knowledge by collecting data, making geologic maps, and interpreting the geology of several areas while living and working in the field. At UAF, GEOS 351 W “Field Geology” is our field camp and 8-credit capstone course, and is offered every other year. To assess the effectiveness of the capstone and compare the preparation and outcomes of UAF and non-UAF students enrolled in the course, we recently composed and conducted a 65-question online survey of students who completed field camp in 2011. Twelve out of 16 (75%) students in the course responded to the survey, including 5 of 5 non-UAF students. Students strongly agreed that their field camp experience and education with UAF was challenging, exceptionally valuable, and a highlight of their undergraduate education. Student feedback is being incorporated into modifications to course content and logistical details, and will be implemented in 2013. These include the possible addition of a GIS component to one or more projects, and expanding the field office wall tent space in Denali Park.
• **Capstone Courses and Rubrics**: Students choosing the Geology, Paleontology and Geospatial Sciences Options will all complete a capstone course in Field Geology (Geos 351). Final projects will be assessed with an online version of the attached Field Capstone Rubric beginning in summer 2013. Students selecting the Geophysics Option will complete a capstone Undergraduate Research project (Geos 488) to be assessed with an online version of the attached Capstone Project or Thesis Rubric.

• **O and W Rubrics**: Multiple O and W courses are offered as required or elective courses within the department. Final presentations and papers will be assessed with O and W rubrics. Currently, faculty teaching O and W courses all have their own rubrics. These faculty have agreed to communicate over the summer to generate one O rubric and one W rubric that will be made available online and used for all final presentations and papers, respectively. This will facilitate comparison of skills between courses and allow us to determine which courses are most effective in terms of developing oral and written communication skills.

• **Undergraduate Exit Survey**: All graduating seniors will complete an online exit survey (attached) that includes questions about their experience at UAF and their plans following graduation.

• **Tracking Graduates and Alumni**: We will use e-mail, the new departmental Facebook page, internet searches to track our graduates’ career paths. We will also keep track of non-UAF students who completed our capstone field course. Two non-UAF students who completed the capstone in summer 2011 were nominated by field camp faculty for the prestigious National Association of Geoscience Teachers and United States Geological Survey Cooperative Field Training Program; both were offered positions working with USGS in summer 2012.

**BA in Earth Science**

The BA program is currently undergoing substantial revisions which will reduce the number of required courses and provide several options, including an option in Geological Hazards and an option in Geoscience Education. As a result of the significant changes to the program to be submitted in October 2012, we have elected to postpone revision of our assessment plans for this program until May 2013, so that the revised assessment can be developed in conjunction with the modified degree program.

**Graduate Programs**

Assessment plans for the MS program in Geology, PhD program in Geology, MS program in Geophysics and PhD program in Geophysics are attached. Whereas the objectives and outcomes for each of the programs are different, all of our graduate programs emphasize critical thinking, oral and written presentation skills. Hence we have created five assessment tools that can be used for each of the four graduate programs.

• **Graduate Program Assessment Questionnaire**: This form will be completed following each graduate student’s annual committee meeting. The committee will discuss the student’s performance and provide a consensus evaluation of whether the student is on schedule, ahead of schedule, or behind schedule with respect to skills and abilities.
• **Capstone and Thesis Rubric:** The Capstone Project and Thesis Rubric (attached) is designed to assess evidence of critical thinking skills and the quality of written and/or oral communication skills for graduate as well as undergraduate students. The form will be set up online so that evaluators can click a box to indicate whether they are assessing a comprehensive exam, thesis defense, or written thesis.

• **Annual Report Attachment:** In order to better monitor graduate student progress in written and oral presentations, we have added a form to the annual committee meeting report to be completed by the graduate student (Dept. of Geology & Geophysics Annual Report Attachment). Graduate students will provide citations for all papers and reports published during the previous year or in press at the time of the meeting. Students will also provide dates of conferences attended, including citations for posters or talks. This form will soon be available online to facilitate submission and expedite compilation of annual data reports.

• **Graduate Exit Survey:** MS and PhD graduates will complete an online exit survey (attached) that includes questions about their experience at UAF and future plans, including employment and/or continuing education.

• **Tracking Graduates and Alumni:** We will use e-mail, the new departmental Facebook page and internet searches to track our graduates’ career paths. We will also coordinate with CNSM on college-wide efforts to track both undergraduate and graduate alumni.
Geology and Geophysics Graduate Program Assessment Questionnaire
- this will be an online form!

The purpose of this form is for our department to improve its graduate programs. This form is filled out at every student’s annual committee meeting and any other event (e.g. defenses, comprehensive examinations, etc.). At the end of the academic year, we compile the results to see how well our program is educating all students. If we find that many students fall short of an assessment standard, we will work to improve the curriculum's teaching of that standard. This form is anonymous and is not used to grade individual students. If in committee discussions, if they find that a student's performance is superlative or lacking in some areas (compared to expectations for their program / year in program), these areas should be mentioned on the "Annual Report of Advisory Committee" form from the graduate school. This graduate school annual report form is the way that our programs formally communicate individual progress towards degree with students.

The purpose of the student bringing the form is for students to see the areas in which they should be developing as scientists. After the student gives the annual committee meeting presentation, the committee will form a consensus opinion that will be entered onto this form. If a consensus is not possible, then two forms may be filled out with differing opinions.

For each assessment standard, the committee should put a mark in the column corresponding to the student's performance level. Leave the row blank if the point does not apply. Note that masters students are not expected to perform beyond the "masters graduate" level to complete their program and we will assess masters and doctorate programs separately.

Basic Demographic Information: Value
1. Program (1=Geology, 2=Geophysics)
2. Degree (1=MS, 2=PhD)
3. Year in graduate program (1=1st, 2=2nd...)
4. Event type (1=Annual meeting 2=MS Comp Exam 3=MS defense 4=PhD Oral 5=PhD Defense)
Is the student performing above or below the expectations for a student at their level (i.e. is a 3rd year PhD student performing at the level we expect for a 3rd year PhD student).

<table>
<thead>
<tr>
<th>Specific knowledge of and ability to critically analyze related literature</th>
<th>2 years ahead</th>
<th>1 year ahead</th>
<th>at expected level</th>
<th>1 year behind</th>
<th>2 years behind</th>
<th>Not Applicable</th>
<th>Not enough information</th>
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<td>Technical/Field Data Collection abilities</td>
<td>XXX</td>
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<td>Quantitative/Analysis abilities</td>
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<td>Presentation skills</td>
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<td>Writing Skills</td>
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<td>Ability to formulate hypotheses and articulate methods for testing hypotheses (Ph.D.)</td>
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<td>Ability to act as an independent researcher (Ph.D.)</td>
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</table>
1. Provide a full reference for all journal articles or book chapters accepted for publication since July 1 2010. Please list as “in press” accepted but not yet published, and provide a DOI where available.

2. Provide the following information for all conferences you attended since July 1 2010.
   Name of the conference:
   Month, year, and place:
   Author(s):
   Title of the presentation:

3. Provide the following information on all grants, scholarships, fellowships, etc. that you applied for. Indicate with an * those that were successful, and provide the additional information requested:
   Name of the award:
   Principal investigators:
   Primary purpose: (e.g., research, travel, equipment)
   For successful applications:
   Award period:
   Amount of award:

4. Provide information on any honors or special recognition that you received this year:
Graduate Program Exit Survey  (will be on line)

Program     Geology/Geophysics
Degree       MS/PhD

If PhD, do you have a MS from another institution?
What semester and year are you graduating?
How many years have you spent in this program?
What is your plan after graduating?
   a. industry job related to geology/geophysics/other geoscience
   b. agency/nonprofit job related to geology/geophysics/other geoscience
   c. informal science education/teaching
   d. K12 teaching job for geology/physics/other
   e. community college faculty job in geology/geophysics/physics/other
   f. 4yr Institution faculty in geology/geophysics/physics/other
   g. continuing for another degree in geoscience at UAF/another institution
   h. post doc at UAF/another institution
   i. job unrelated to geology/geophysics (comment box)
   j. other (please specify)

How were you supported during your time at UAF?
1. How many semesters of TA support?
   a. summers of TA support?____
2. How many semesters of RA support? ___
   a. summers of RA support?___
3. How many semesters of Fellowship (such as GK-12, NSFGRF or NASA GRF) support?
   a. summers of Fellowship support?___
4. How many semesters of external industry/agency support? ______
5. How many summers of industry/agency support?___
6. How many Scholarships/Fellowships of any kind did you apply for
   a. How many did you receive?
7. Did you apply for a thesis completion fellowship?____
   a. Did you receive it?____
8. How many proposals did you contributed to writing?
   a. How many were funded?
9. How many Travel or Departmental awards did you apply for?
   a. How many did you received?
10. How many peer-reviewed publications did you contribute to?
    a. How many did you first author?
11. How many Technical Reports did you contribute to?
    a. How many did you first author?
12. How many Conference/Meeting Abstracts did you contribute to?
    a. How many did you first author?
13. How many conferences did you attend and give a presentation or poster?
    a. For how conferences many were your travel costs at least 75% covered?
14. Any other sources of funding? (comment box)
Please state whether you strongly agree to strongly disagree to these statements. Please provide comments to help us improve each situation.

1. The graduate program was well suited to my personal or professional goals.
   a. Comment Box
2. My employment is directly related to my field of research in the graduate program.
   a. Comment Box
3. My field of research was relevant to geoscience employment opportunities.
   a. Comment Box
4. The program prepared me for geoscience employment.
   a. Comment Box
5. I would recommend the program to another student.
   a. Comment Box
6. I would recommend my advisor to another students.
   a. Comment Box
7. I feel well prepared to face expected professional challenges.
   a. Comment Box
8. The quality of graduate instruction in the department was high.
   a. Comment Box
9. The graduate instruction in the department provided the right breadth and depth of content so that I felt confident in conversing with colleagues at national and international meetings.
   a. Comment Box
10. Laboratory equipment was modern, functional, available, and adequate for my needs.
    a. Comment Box
11. Computational systems and software were adequate and available.
    a. Comment Box
12. My research project was adequately funded by research grants, industry/agency support, or by the department.
    a. Comment Box
13. I was able to find summer support either as an RA or through geoscience employment.
    a. Comment Box
14. I had adequate opportunity for community outreach.
    a. Comment Box
15. The faculty in the department provided the mentoring I needed to find and apply an appropriate post graduation positions (whether academic, industry, agency, or other).
    a. Comment Box

Please provide any additional comments or suggestions about your experience in the department that will help us improve in the future.

1. The best part of my graduate experience was (comment box)
2. If I could change one thing in the graduate program that would be (comment box)
Field Capstone Rubric

To be rated excellent, good, adequate, inadequate (except for Y/N questions)

Background on student

1. UAF student? (Y/N)
2. General academic abilities
3. Enthusiasm for geology
4. Effort put into this course

Skills and knowledge from field camp

1. Ability to navigate and locate contacts and structures on topographic maps
2. Quality of field notes
3. Rock identification
4. Stratigraphic concepts
5. Measurement of structural attitudes
6. Mapping and interpretation of structures
7. Understanding of geologic context of map areas (knowledge of Alaska geology)
8. Ability to integrate local with regional-scale geologic features
9. Ability to use geologic evidence
10. Writing ability

Recommend this student for geologic employment and/or graduate school? (Y/N)
### Capstone Project or Thesis Rubric

Student’s name ___________________________ Date ______________

Project or Thesis Title _______________________________________

☐ BS Capstone Project ☐ MS Thesis ☐ PhD Thesis ☐ Oral Defense/Presentation
☐ MS Comprehensive Exam ☐ PhD Written Comprehensive ☐ PhD Oral Comprehensive

Completed by _____________________________________________

<table>
<thead>
<tr>
<th></th>
<th>Yes (excellent)</th>
<th>Somewhat (adequate)</th>
<th>No (inadequate)</th>
<th>N/A</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Does the capstone paper/presentation represent the student’s own scientific research?</td>
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<tr>
<td>2.</td>
<td>Does the capstone paper/presentation make a compelling argument for the significance of the student’s research within the context of the current literature?</td>
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<td>3.</td>
<td>Does the capstone paper/presentation clearly articulate the student’s research goals?</td>
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<td>4.</td>
<td>Are the methods appropriate given the student’s research agenda?</td>
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<td>5.</td>
<td>Is the data analysis appropriate and accurate?</td>
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<td>6.</td>
<td>Does the thesis skillfully interpret the results?</td>
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<td>7.</td>
<td>Are the tables and figures clear, effective and informative?</td>
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<td>8.</td>
<td>Is there a compelling discussion of the implications of findings?</td>
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<td>9.</td>
<td>Does the literature review recognize prior work in the field?</td>
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<td>10.</td>
<td>Are the citations presented consistently and professionally throughout the text/presentation and in the list of works cited?</td>
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<td>11.</td>
<td>Is the writing/presentation appropriate for the target audience?</td>
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<tr>
<td>12.</td>
<td>Is the paper/presentation clearly communicated and free of language errors?</td>
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Geoscience Concept Inventory

Name ____________________________  GEOS 101  Spring 2012

Directions: Answer each of the following multiple-choice questions based on your current understanding of the Earth. Note that some questions have more than one correct answer. Don't worry about your score. These questions don't count toward your grade in this course. They merely help us to decide what concepts to focus on.

1. The figure to the right is a view of one-half of the Earth’s surface as seen from space today. The gray areas represent land, and the white represents water. Which of the other figures (below) most likely represents this half of the Earth’s surface when humans first appeared on Earth?

![Images of Earth's surface with different land and water distributions.]

A  B  C  D

2. Which of the following statements about the age of rocks is most likely true?

A  Rocks found in the ocean are about the same age as rocks found on continents
B  Rocks found on continents are generally older than rocks found in the ocean
C  Rocks found in the ocean are generally older than rocks found on continents
D  Ages of rocks are not precise enough to determine which rock type is older

3. A large, ashy volcanic eruption occurs in Europe. What effect could this eruption have on the air temperature near the Earth's surface one year later?

A  Volcanic eruptions do not affect air temperature
B  Only the air in Europe would be warmer
C  Most of the Earth's air would be warmer
D  Only the air in Europe would be colder
E  Most of the Earth's air would be colder
4. The following maps show the position of the Earth’s continents and oceans. If the •’s on each map represent volcanoes, which map most accurately depicts places where volcanoes are found?

A. Mostly along the margins of the Pacific and Atlantic Oceans
B. Mostly along the margins of the Pacific Ocean
C. Mostly in warm climates
D. Mostly on continents
E. Mostly on islands
5. Why does the Earth have a magnetic field?
   A The Earth contains crust of different compositions
   B The Earth has a gravitational force of attraction
   C The Earth contains moving liquid metal
   D The Earth has an orbit around the Sun
   E The Earth does not have a magnetic field

6. Which of the following statements provides the strongest evidence for the existence of Earth’s magnetic field?
   A People would float off into space without a magnetic field
   B People can use the magnetic field to help them navigate
   C The Earth revolves around the Sun because of its magnetic field
   D The Earth rotates about its axis because of its magnetic field
   E The Earth does not have a magnetic field

7. Radioactivity is a process that sometimes occurs on Earth. Which of the following statements about radioactivity are true? Choose all that apply.
   A Radioactivity only occurs if carbon is present in an object
   B Radioactivity can occur in the atmosphere, but not at the Earth’s surface
   C Radioactivity can only be created by people, such as in nuclear power plants
   D Half-life is a measure of how quickly radioactivity decreases
   E Half-life decays away and eventually disappears

8. Which of the following techniques can scientists use to gather evidence about whether the very center of the Earth is mostly a solid, a liquid, or a gas? Choose all that apply.
   A Drilling through the center of the Earth
   B Studying motion caused by earthquakes
   C Analyzing pictures taken by satellites
   D Scientists are not able to determine what lies at the center of the Earth

9. Where can glaciers be found today? Choose all that apply.
   A In the mountains
   B At the South pole
   C At sea level
   D In the Arctic Ocean
   E Near the equator
10. Which of the figures below most accurately depicts the order and timing of major changes in life on Earth?

**TODAY**
- HUMANS APPEAR
- DINOSAURS DISAPPEAR
- DINOSAURS APPEAR

**TODAY**
- HUMANS APPEAR
- DINOSAURS APPEAR
- LIFE APPEARS

**TODAY**
- HUMANS APPEAR
- DINOSAURS DISAPPEAR
- LIFE APPEARS

**TODAY**
- HUMANS APPEAR
- DINOSAURS DISAPPEAR
- LIFE APPEARS

**TODAY**
- HUMANS APPEAR
- DINOSAURS DISAPPEAR
- LIFE (including dinosaurs and humans) APPEARS

11. How does a pile of sand become a solid rock, known as sandstone?

   A. The sun bakes the sand, causing it to stick together
   B. Water evaporates from the sand, causing it to dry and stick together
   C. When the sand is deeply buried, pressure and heat cause it to stick together
   D. Lava flows over the sand, heating it and causing it to stick together
12. The map below shows the position of the Earth’s continents and oceans today. The gray areas represent land, and the white represents water. Which of the following best explains why the ocean basins look the way they do?

![Image of the Earth's continents and oceans]

A Meteor impacts caused the ocean basins to form this way  
B Continents moving caused the ocean basins to form this way  
C The Earth expanding caused the ocean basins to form this way  
D The Earth warming caused the ocean basins to form this way

13. When an earthquake occurs, which of the following is always true?

A Visible cracks appear on the Earth's surface  
B People can feel the Earth shake  
C Man-made structures are damaged  
D Energy is released from inside the Earth  
E The gravitational pull of the Earth increases

14. Using satellites, geologists have determined that continents on opposite sides of the Atlantic Ocean are moving away from each other. About how much wider does the Atlantic Ocean get every year?

A A few centimeters  
B A few meters  
C A few kilometers  
D We have no way of knowing  
E The width of the ocean doesn’t change
15. Geologic evidence indicates that at one time the Earth consisted of a single continent, called Pangea. What happened to it?

A Meteors hit the Earth, causing the continent to break into smaller pieces
B The Earth expanded over time, causing the continent to break into smaller pieces
C Material beneath the continent moved, causing the continent to break into smaller pieces
D The Earth got hotter over time, causing the continent to break into smaller pieces
E The continents have always been in roughly the same place as they are today

16. Commercials and public service announcements often state “calcium (in milk) is important for healthy bones.” In this statement the word ‘calcium’ actually refers to:

A The element calcium, Ca
B The calcium ion, Ca$^{2+}$
C The mineral calcium, Ca$^0$
D The rock calcium, Ca$_2$
E A special variety of calcium found only in milk

17. Which of the following best summarizes the relationship between volcanoes, large earthquakes, and tectonic plates?

A Volcanoes typically occur on islands, earthquakes typically occur on continents, and both occur near tectonic plates
B Volcanoes and large earthquakes both typically occur along the edges of tectonic plates
C Volcanoes typically occur in the center of tectonic plates and large earthquakes typically occur along the edges of tectonic plates
D Volcanoes and large earthquakes both typically occur in warm climates
E Volcanoes, large earthquakes, and tectonic plates are not related, and each can occur in different places

18. Which of the following best describes Earth’s mantle?

A Mostly solid rock
B Molten, liquid rock
C Mostly liquid with blobs of solid rock
D Solid rock with gas-filled caverns
E Solid rock with iron-filled cavities
19. Which of the following figures most closely represents the location of the Earth’s tectonic plates?

A

B

C

D

20. Although rocks are solid, it is possible for them to bend and fold very, very slowly if heat and pressure are applied. Which of the following diagrams shows a cross section of rock layers folded to form an upright arch?

A

B

C

D
Undergraduate Exit Survey (will be on line)

Option  Geology/Geophysics/GeoSpatial/Paleo
Degree BA/BS

What semester and year are you Graduating?
How many years did you spend in our program?
Were you a full time or part time student?
Did you transfer from another institution?
  What semester did you transfer?
What is your plan after graduating?
  a. industry job related to geology/geophysics/other geoscience
  b. agency/nonprofit job related to geology/geophysics/other geoscience
  c. informal science education/teaching
  d. K12 teaching job for geology/physics/other
  e. community college faculty job in geology/geophysics/physics/other
  f. 4yr Institution faculty in geology/geophysics/physics/other
  g. continuing for another degree in geoscience at UAF/another institution
  h. post doc at UAF/another institution
  i. job unrelated to geology/geophysics (comment box)
  j. other (please specify)

What inspired you decision to declare a Geoscience major? (mark as many as apply)
  I took Geology 101
  I took Geology 120
  I took Geology 106
  I took an introductory geology course at another institution.
  I took a summer program in high school or college. Which one?
  I decided because of my high school classes/teachers
  I decided based on media representations of geology concepts
    (such as newspaper articles, television, movies) Which one?
  My parent or other close family member encouraged me to consider geology
  A friend inspired me to consider geology.
  Other
  COMMENT BOX (for all)

How were you supported during your time at UAF? (click all that apply)
  My family provided financial support
  I took out student loans
  I received a scholarship
  I had a job to pay for school
  If possible, please provide rough percentages for how your were supported
    (for example 25% from family, 50% student loans, 25% scholarships)
  COMMENT BOX
Please state whether you strongly agree to strongly disagree to these statements. Please provide comments to help us improve each situation.

1. The undergraduate program was well suited to my personal or professional goals.
   a. Comment Box

2. My employment is directly related to my option in the geoscience program.
   a. Comment Box

3. My option is relevant to geoscience employment opportunities.
   a. Comment Box

4. The program prepared me for geoscience employment.
   a. Comment Box

5. I would recommend the program to another student.
   a. Comment Box

6. I would recommend my academic advisor to another student.
   a. Comment Box

7. I was active in the GeoClub
   a. Comment Box

8. The GeoClub provided a valuable community/friends/study partners to make my undergraduate experience better
   a. Comment Box

9. I feel well prepared to face expected professional challenges.
   a. Comment Box

10. The quality of undergraduate instruction in the department was high.
    a. Comment Box

11. The undergraduate instruction in the department provided the right breadth and depth of content so that I felt confident in conversing with colleagues.
    a. Comment Box

12. Equipment in labs was modern, functional, available, and adequate for our lab assignment needs
    a. Comment Box

13. The computer room computers and software were adequate and available for my needs.
    a. Comment Box

14. I took advantage of opportunities for undergraduate research at UAF.
    a. Comment Box

15. My undergraduate research mentor was supportive and provided a valuable experience.
    a. Comment Box

16. I was able to find summer jobs or internships in geoscience.
    a. Comment Box

17. The faculty were helpful in my finding summer jobs or internships in geoscience.
    a. Comment Box

18. The faculty in the department provided the mentoring I needed to find and apply an appropriate post graduation positions (whether academic, industry, agency, or other).
    a. Comment Box
Please provide any additional comments or suggestions about your experience in the department that will help us improve in the future.

1. The best part of my undergraduate experience was (comment box)
2. If I could change one thing in the undergraduate program that would be (comment box)