Development and implementation of an in-field assessment protocol for an introductory geologic field course

Mary Lou Bevier and Joshua Lee Caulkins
Department of Earth and Ocean Sciences, The University of British Columbia, Vancouver, Canada

Introduction and Objectives

Many undergraduate geoscience courses at UBC are being revised in order to increase student learning, with support from the Carl Wieman Science Education Initiative (CWSEI). In the introductory field geology course (EOSC 223), we designed and implemented a protocol to assess student abilities while working in the field. This new protocol adds another dimension to traditional assessment of students’ final maps, cross-sections and reports.

Our objectives for the new field-based assessment (the “Saltspring Protocol”) are:

1. To improve student learning of field skills and procedures
2. To better quantify field performance and aptitude
3. To increase formative feedback to students
4. To decrease student stress levels

New Assessment Strategy: The Saltspring Protocol

In-field assessments were carried out in parallel with and in addition to regular instructor-student interactions in the field such as discussions of the regional geology or outcrop interpretations. Highlights of the protocol include:

- In-field assessments counted for 30% of the field school grade.
- Students were given sample assessment questions (see figure at right) and a grading rubric on the first day of field school.
- A 2-day grace period was followed by 5 days of formal, in-field assessments.
- Instructors marked students daily on their preparedness, field techniques (e.g., measuring strike and dip), and critical thinking skills (e.g., synthesizing outcrop data, making decisions such as how to interpret geologic relationships or choose where to traverse).
- Instructors assessed student field performance on a scale from 1 (inadequate) to 5 (outstanding).

Results of the Saltspring Protocol

- Improvement in field abilities over the 7-day field school (figure at right) was determined via the following equation:
  \( \text{(Day 6 mark + Day 7 mark) - (Day 3 mark + Day 4 mark)} \) (Days 1 and 2 were the grace period when no marks were given.)
- The Saltspring Protocol provides objective proof that immersion in a field school setting improves student aptitude.
- Strong correlation \( R^2 = 0.59 \) exists between the two variables of each student's mapping mark (e.g. maps, cross-sections, notebooks, reports) with their 5-day in-field assessment mark (see figure at left).
- Results suggest that the Saltspring Protocol may be useful for early identification of students who require additional attention from the instructors and TAs.

Prior Field Assessment Strategy

Prior to 2009, students were assessed at field school by grading the quality of maps, cross-sections, and written work, which is the standard method in almost all field mapping courses taught in North America. Instructors assigned a subjective “field grade” to each student, and students were told up front that “the course director reserves the right to adjust marks accordingly for your field performance and attitude, either for outstanding effort or for unprofessional behaviour.” This process was never quantified and in some cases there were wide variations in the field grade that different instructors assigned to the same student.

Future Revisions

Follow-up Student Feedback

Interviews were conducted 4 months after the field school with 11 students; 3 of the 11 were in-depth interviews lasting up to 30 minutes. Student feedback was significantly more reflective at this time, likely because students were no longer being actively evaluated.

Overall students found the new in-field assessment protocol stressful but also useful to their learning, and the following quotes illustrate the range of their responses:

- “I think it is a good idea to have the assessment; it seems like a smart idea to have the assessment questions worth more than other marks.”
- “I didn’t like how the assessment questions were worth so much; there were a few questions that I didn’t understand.”
- “I hated being put on the spot, I preferred discussions.”
- “It felt like I was being marked on the accuracy of my answers.”
- “[The protocol] allowed me to think more deeply into what my interpretations were and it also gave me a better sense of the field geology...and that people can have multiple interpretations.”
- “I wanted more feedback on whether or not [my answer] was correct.”

Contact us at: mbevier@eos.ubc.ca  jcaulkins@eos.ubc.ca

Follow-up Student Feedback

Interviews were conducted 4 months after the field school with 11 students; 3 of the 11 were in-depth interviews lasting up to 30 minutes. Student feedback was significantly more reflective at this time, likely because students were no longer being actively evaluated.

Overall students found the new in-field assessment protocol stressful but also useful to their learning, and the following quotes illustrate the range of their responses:

- “I think it is a good idea to have the assessment; it seems like a smart idea to have the assessment questions worth more than other marks.”
- “I didn’t like how the assessment questions were worth so much; there were a few questions that I didn’t understand.”
- “I hated being put on the spot, I preferred discussions.”
- “It felt like I was being marked on the accuracy of my answers.”
- “[The protocol] allowed me to think more deeply into what my interpretations were and it also gave me a better sense of the field geology...and that people can have multiple interpretations.”
- “I wanted more feedback on whether or not [my answer] was correct.”

Contact us at: mbevier@eos.ubc.ca  jcaulkins@eos.ubc.ca

Acknowledgements

We thank the Carl Wieman Science Education Initiative at UBC for providing funding for J.L. Caulkins to participate in this project. Special thanks to our fellow instructors (Drs. J. Mortensen, S. Harris, and S. Phillips) and TAs (M. Conlan, T. Rakus) for their assistance in the field and for providing continuing suggestions on how to better assess students in the field. We are grateful to the many students who have made suggestions for improvement to the Saltspring protocol based on their experiences in the course.