Learning Assessment of Core Outcomes
Suggested Focus 2009-2010: Critical Thinking and Problem Solving

SAC Name: Physical Science, Geology and General Science

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1. **Please describe your plan of action for 2009-2010 Academic Year:**

   Geology is a field-based science. Classroom instruction introduces geologic landforms and processes, including those that have taken tens of thousands of lives each year and have impacted the economy in many ways, including the necessity of building hazard mitigation structures. Our SAC has chosen to use a field based project to assess student learning of critical thinking and problem solving. In this project students go out into their local surroundings to find their own examples of landforms which have been discussed in class. Once a student finds a landform it must be documented (described and identified), interpreted (related to the geologic process(es) which created the landform), and assessed (for risk to human land use activities). Students will hand in reports including photographic documentation. This project has been previously used in some G202 Physical Geology courses and during winter quarter of 2010 will be used in all our G202 and GS106 General Science (Geology) courses. We will develop separate rubrics for G202 and GS106, each instructor will then assess their students learning using the appropriate rubric. Finally the instructors will meet to compare results, look for common themes in our students' learning and assess what was learned from this activity and how what was learned can be used to improve our teaching.

2. **When your project is completed, please describe the method(s) you used**.
   - Six instructors evaluated six separate classes; three G202 classes and three GS106 classes. These classes were taught on the Sylvania and Rock Creek campuses winter quarter 2010.
   - The project used for this assessment was not exactly the same for each class, but rather was modified by each instructor to match their particular teaching style.
   - We used a common rubric for all the classes which consisted of seven learning objectives scored on the four level scale used by PCC when describing its core outcomes. (see: http://www.pcc.edu/resources/academic/core-outcomes/co-criticalthinking-problemsolving.html accessed 12/4/09.) The rubric is attached below.
   - Initially our SAC had planned to develop separate rubrics for the G202 and GS106 classes; however only the rubric designed for G202 was completely developed. Our SAC has only two full time faculty, both of whom were teaching G202 winter 2010 and both of whom worked to develop the rubric for G202; unfortunately the group developing the GS106 rubric was left without full time faculty support and never fully developed a rubric specific to GS106.
   - Each instructor was asked to use the rubric in scoring the landscape project. The manner in which each instructor did this varied somewhat.

- All six instructors met 5/7/10 to discuss and review the assessment process. Instructors compared rubric results, examined representative work from one another's classes and shared their analysis of what they had learned from the assessment process.
- An issue that came to light was the highly variable student response to being asked permission to use their class work for assessment, in many classes all or almost all students granted permission to use their work while in one class only about half the students granted permission to use their work. In one case the instructor forgot to ask for student permission.
- In total 114 student projects were examined in preparing this assessment. Those projects for which students did not give permission were not used.

3. What did you learn?

- Students enjoyed the challenge of applying what they learned in class to the world around them, in the words of one student "I think the best part of this trip was getting outside the realm of the classroom and applying what we learned in class to the outside environment. It may have been tough but I feel it really solidified the education I gained from Geology 202."
- Many of our students were pleasantly surprised to find that they could indeed identify landforms on their own while other students where alarmed at the large number of geologic hazards they were able to identify.
- The average score on the rubric was 3 out of a possible 4, indicating that on average our students are able to "demonstrate comprehension" and "apply essential knowledge and skill".
- Of the three major landform categories analyzed in most student projects: stream features, mass wasting features and coastal features, mass wasting features proved most difficult for students to interpret correctly.
- While many students were able to apply what they had learned in class to the landscape around them at a generic level, few were able to make their analysis specific to their individual landform and its surroundings.
- During discussion we discovered that our students could be divided into three groups:
    - Those that had good classroom attendance and "got it"
    - Those that had good classroom attendance but had a hard time applying what they learned to the real world due to being too definition driven in their learning
    - Those that had poor classroom attendance and didn't "get it"
- An instructor with previous experience using this project in their classes reported higher levels of student achievement this term than in prior terms; in the instructor's analysis this was due to including the grading rubric in the assignment which had not been done in earlier terms.
- Those instructors who had not previously used the landform identification project found it worthwhile and are likely to use it again in their teaching.

4. What changes, if any, are you making or recommending as a result?

- There was a general sense that the landscape project assignments used by each instructor could be refined and sharpened to elicit more critical thinking by the students.
- Some instructors are considering revising how they teach about slope processes in their classes to put a greater emphasis on analyzing the controls of slope stability and triggers of mass wasting events.

G202 Landscape Project Scoring Rubric				
Learning Objective	**Level 4**	**Level 3**	**Level 2**	**Level 1**
Identify, describe and classify landforms in the environment.	All landforms are identified clearly, described accurately and completely with a clear indication of scale and classified correctly. Landforms descriptions are specific and detailed.	Most landforms are identified clearly, described accurately and completely with a clear indication of scale and classified correctly. Landform descriptions are somewhat specific and include some detail.	Some landforms are identified clearly, described accurately and completely with a clear indication of scale and classified correctly. Landform descriptions are generic and lack specific details.	Landforms are not identified clearly, described vaguely if at all without any indication of scale and classified incorrectly or not classified. Landform descriptions are fragmentary and hard to follow.
Infer the geologic process which created a specific landform and describe how this process created the landform over time and will continue to shape the landform in the future.	In all cases the processes which created a landform are inferred correctly. Process descriptions are complete and specific to an individual landform and its surroundings. Past and future changes of all the landforms are correctly and clearly described and/or illustrated.	In most cases the processes which created a landform are inferred correctly. Process descriptions are mostly complete and somewhat specific. Past and future changes of most of the landforms are correctly and clearly described and/or illustrated.	In some cases the processes which created a landform are inferred correctly. Process descriptions are incomplete and generic. The process descriptions could apply to any example of the landform. Past and future changes of some of the landforms are correctly and clearly described and/or illustrated.	Processes which created a landform are not inferred correctly or not inferred at all. Process descriptions are fragmentary and hard to follow. There is no description of how the landform has changed over time.

G202 Landscape Project Scoring Rubric				
Learning Objective	**Level 4**	**Level 3**	**Level 2**	**Level 1**
Evaluate how human activity has impacted the development of a landform and/or how the landform and the processes which create the landform impact human land use in the vicinity of the landform.	In all cases the human impact on the development of the land form is clearly and accurately evaluated. In all cases the impact of the landform and its associated land forming processes on human land use is clearly and accurately evaluated.	In most cases the human impact on the development of the land form is clearly and accurately evaluated. In most cases the impact of the landform and its associated land forming processes on human land use is clearly and accurately evaluated.	In some cases the human impact on the development of the land form is clearly and accurately evaluated. In some cases the impact of the landform and its associated land forming processes on human land use is clearly and accurately evaluated.	The human impact on the development of the land forms is incorrectly evaluated or not evaluated. The impact of the landform and it associated land forming processes is incorrectly evaluated or not evaluated.
Identify a structure designed to manage risk associated with a landscape forming processes, identify the hazard creating risk and what of value is put at risk. Explain how the structure manages risk.	The structure managing risk is clearly identified and clearly and specifically linked to the land forming hazard it manages. What of value is protected by the structure is clearly and specifically identified. How the structure operates to manage risk is clearly and specifically explained.	The structure managing risk is somewhat clearly identified and linked to the land forming hazard it manages in a general way. What of value is protected by the structure is identified in a general way. How the structure manages risk is explained in a general way.	The structure managing risk is poorly identified and vaguely linked to the land forming hazard it manages. What of value is protected by the structure is vaguely identified. How the structure manages risk is vaguely explained.	The structure managing risk is vaguely identified or not at all, no links are made between the structure, landscape forming processes, risk, hazard and value. How the structure operates to manage risk is incorrectly explained or not explained at all.

G202 Landscape Project Scoring Rubric				
Learning Objective	**Level 4**	**Level 3**	**Level 2**	**Level 1**
Use graphical documentation to clearly describe the landform.	In all cases the landform and it associated landscape forming processes are clearly described using graphical documentation.	In most cases the landform and it associated landscape forming processes are clearly described using graphical documentation.	In some cases the landform and it associated landscape forming processes are clearly described using graphical documentation.	Graphical documentation of the landforms and their associated landscape forming processes is unclear or missing.
Describe the approach and methodology used to select the landforms for this project.	The method used to select landforms for this project is clearly explained.	The method used to select landforms for this project is partially explained.	The method used to select landforms for this project is vaguely explained.	The method used to select landforms is incoherently explained or not explained at all.
Demonstrate a personal voice when reflecting upon how this project has altered their view of the physical environment.	The voice used in reflecting upon how this project has altered their view of the physical environment is lively and idiosyncratic.	The voice used in reflecting upon how this project has altered their view of the physical environment displays some personality but is not fully developed.	The voice used when reflecting upon how this project has altered their view of the physical environment is generic and banal.	There is no clear or consistent voice used when reflecting upon how this project has altered their view of the physical environment.