Geology
GEOL 121: Prehistoric Life: DNA to Dinosaurs
Alison Olcott Marshall

Core Goal 1.1
2016 Haufler KU Core Innovation Award Winner

Q1. **What evidence does your department / program use to determine whether students are achieving your KU Core goals in this course?**

This class is essentially a paleontology course for non-majors, and so my primary goal is to have students gain the ability to think critically about two of the major issues facing humans today—climate change and the prospect of mass extinctions—through the lens of geological time. Given that students in this class usually have little to no experience in evaluating scientific data, synthesizing scientific data into their own conclusions, and supporting those conclusions with data gleaned from scientifically supported sources, I decided to use a rubric to assess how well students could explain, develop and support their ideas in take home essay exams they took 1/3 and 2/3 of the way through the semester.

Q2. **What quantitative format does your department / program use to summarize the degree to which students in this course achieve the KU Core goals?**

I used a rubric based on the UCCC's rubric on critical thinking. For assessment purposes, I focused on the first two dimensions from that rubric (Explanation of issues and Selecting and using information to investigate a point of view or conclusion) and the last (Conclusions and related outcomes). I broke each of these three into further categories, so I could assess the quality and relevance of the sources the students used, and how they explained their issues, and how they developed and supported their conclusions. The rubric is below.

Dimension 1: Problem to be considered is stated clearly	1: introduction acknowledges prompt	0: doesn't acknowledge prompt		
Dimension 2: Description of issue is on topic with clear direction	3: on topic with clear direction	2: some irrelevance but mostly on topic	1: numerous irrelevant or unconnected details	0: no connected details
Dimension 3: Conclusions developed with appropriate and connected details	2: appropriate details mostly internally connected	1: appropriate details not internally connected;	0: they are not	
Dimension 4: Most ideas build and culminate in conclusion	2: most ideas build and culminate	1: some ideas build and culminate	0: none (stating facts)	
Dimension 5: Quality of sources used to support evidence	3: peer reviewed scientific literature	2: public science (museum websites, textbooks, class material);	1: informal (blogs, newspaper, magazine, encyclopedia)	0: no sources
Dimension 6: Sources used are relevant to the ideas	3: relevant sources well connected to ideas	2: relevant sources not well connected to ideas	1: irrelevant sources	0: no sources

Q3. **Please describe your evaluation process, including rubrics, metrics, and assignment instruments (e.g. description of the assignments, test questions, final exam, final project, etc.) and how your evaluation aligns to the learning outcomes.**

For this round of assessment, two take home essay exams done by the Fall 2014 class were assessed. These assignments required students to answer 2 of 3 provided questions, questions that were designed to make the students synthesize, apply, and reflect on their knowledge gained in the course. These exams were open book and required the students to seek out (and cite) sources to answer each prompt in 1-2 page essays. Students had 5 days to write these exams to give them adequate time for reflection and synthesis. These exams were then anonymized (each student was assigned a random ID number) and then scored using the rubric described in question 2. This rubric evaluated how the students explained the issue, and the focus of the essay on the issue, how the students developed the ideas that supported their conclusions, and whether these conclusions were supported by relevant facts, and then finally the quality and relevance of the sources used. As neither assignment was a final integrative assignment, I did not feel there was a true "before" and "after" represented, so I averaged the scores received by each student on all 4 of the essay questions. These numbers were then normalized to a 4-point scale, and I then calculated the percentage of students in each of the provided categories.

Q4. **Please provide a quantitative summary of student achievement in this course in the assessment period. This may take the form of a distribution of scores over several dimensions of the learning outcome or a single comprehensive assessment of the learning outcome.**

Dimension	4: Exemplary (%)	3: Good (%)	2: Satisfactory (%)	1: Basic (%)	0: Outcome not met (%)
Dimension 1: Problem to be considered is stated clearly	69%	18%	9%	4%	0%
Dimension 2: Description of issue is on topic with clear direction	18%	58%	24%	0%	0%
Dimension 3: Conclusions developed with appropriate and connected details	29%	49%	22%	0%	0%
Dimension 4: Most ideas build and culminate in conclusion	27%	38%	33%	2%	0%
Dimension 5: Quality of sources used to support evidence	0%	0%	56%	33%	11%
Dimension 6: Sources used are relevant to the ideas	13%	42%	20%	20%	4%
Average across all dimensions	26%	34%	27%	10%	3%

Q5. What percentage of the students achieved at least basic overall competency in this learning outcome? Please also briefly state how you have defined basic competency for this purpose.

My ultimate goal would be to have all students at least attain "Satisfactory" status in the outcomes, so averaging across all dimensions, 87% of the students are at Satisfactory or above. However, of the 13% below Satisfactory, only 3% of them failed to attain the outcome goals, with 10% achieving at least a "Basic" understanding of the concepts.

Q6. Provide a descriptive summary of student achievement in meeting the Goal's learning outcome.

I was pleased with the gains students made in their critical thinking abilities. Students begin this class with essentially no experience in interpreting or making scientific arguments, and I am pleased to see them begin to develop that skill in the class. They especially seem to make great gains in explaining and constructing their argument, although picking the appropriate evidence still seems like more of a challenge. However, it is worth noting that part of the dimension in which they did the worst, Quality of Sources, was assessing whether or not they used a peer review source, which is not something they were instructed explicitly to do.

Q7. The intent of this assessment is to promote improvement in meeting KU Core goals for greater numbers of students. What changes are suggested by the data and results you report above that would improve the achievement of this learning outcome?

Selecting the proper types of evidence to support a conclusion is important in any field, but in science it is especially crucial given the number of nonscientists posing as experts (i.e., there are a large number of blogs and journals run by Creationists that look scientific but that are not appropriate sources of information for this class). Given this assessment evidence, I am planning on spending even more time this semester on how to pick an appropriate source and how to present information from that source to support your hypothesis. I have a Writing Fellow associated with the class this semester, which should help, and I have also utilized many of the videos offered by the library on finding and using sources, so I am hoping to see improvement in that dimension. Finally, I have rewritten the exam prompts to explicitly mention using peer reviewed scientific sources, as I am not sure many students even realized that was an option. Also, I would like to be able to assess the end product of the semester, but instead of a final exam the students work on a large self-directed group research project. This project involves a great deal of synthesis and application, but I will have to develop a strategy for trying to assess a team final output.