Draft Assessment Data Analysis Plan

DNS 1/22/13

There are three main areas that fall under data analysis at this point:

- *We must evaluate student responses from GLE multiple choice questions using standard test theory protocols.*

  GLE multiple choice analyses are relatively straightforward. Distractor and question validity analyses will be completed using raw student responses. For single answer questions, distractors should receive a minimum 5% response rate and correct response rates should fall between 25-85%. Simple frequency analyses will be used for multi-select questions. Questions that pass frequency analyses screening will be scored using the GLE rubric (single answer correct = 1, incorrect =0; multi-select answers all correct = 2, more correct than incorrect = 1, more incorrect than correct = 0). Exact procedures for completing these analyses using our GLE scoring scheme are TBD. Rubric score frequencies for multi-select questions will be analyzed to ensure all scores are possible. Questions that pass screening will be consolidated at the student level and used for item discrimination analyses. Cutoff discrimination scores are: optimum 0.35-1.0; minimum 0.2. Standard psychometric tests will be completed for questions that meet frequency and discrimination index criteria.

- *We need to establish inter-rater reliability for scoring of student essay responses.*

Some sample of GLE essay questions will be independently scored by at least two raters using existing rubrics. Scores will be compared for inter-rater reliability. Where necessary, rubrics will be modified and student responses re-scored. If possible, student responses will be used in discrimination analyses and to establish benchmark examples for future scoring.

- We need to independently evaluate student embedded assessment data.

Samples of embedded assessments provided by piloting developers (and testers?) will be independently scored using module rubrics. Inter-rater reliability will be assessed. Scores will be compared to those provided by piloting institutions and used to inform curriculum revisions. A matrix mapping embedded assessments to project goals will be developed as shown below.

| **Course/module addresses one or more geoscience-related grand challenges facing society**: | Climate of Change Embedded Assessments | Earth's Mineral resources |
|---|---|---|
| Resource Issues | | Concept Map |
| Environmental issues | | |
| Biogeochemical cycles | | |
| Biologic diversity | | |
| Ecosystem functioning | | |
| Climate variability | Level 2 | |
| Hydrologic forecasting | | |
| Environmental Change impact on pathogens | | |
| Resource Extraction | | Question 1 (3) |
| Land use/Land Cover | | Question 1 (4) |
| recycling | | |

**Course/module develops student ability to address interdisciplinary problems**:

Interactions between Earth Science and …

| | | |
|---|---|---|
| Economic issues | | Question 2 (5) |
| Societal issues | | Concept Map |
| Policy Issues | | |
| Geography | | |
| Social Sciences | | |
| Humanities | | |

**Course/module improves student understanding of the nature and methods of geoscience and developing geoscientific habits of mind**

| | | |
|---|---|---|
| Making observations | | |
| Testing hypotheses | | |
| Comparing modern processes to those in geologic record | | |
| Comparing commonalities and differences | | |
| Converging lines of evidence | | |
| Testing through prediction | Level 1 | |
| Recognizing role of observation | | |
| Spatial and temporal organizational schemes | | |
| Earth is long-lived | | |
| Earth as a complex system | | |
| Temporal variety of earth processes (long and short) | | |
| Collaboration as a methodology | | |

**Course/module incorporates systems thinking**:

| | | |
|---|---|---|
| Multiple system approach | Level 3 | |
| Open versus closed systems | | |
| Importance of interactions between spheres | Level 3 | Question 2 (3) |
| Perturbation in one system affects others | Level 3 | |
| Multiple causal factors influencing outcomes | | |
| Forcing and feedback mechanisms | Level 3 | |
| Flux, reservoir, residence time thresholds | | |
| Linkages between human and environmental systems | | |