

Date: September 7, 2004

To: Committee on General Education and Intercollegiate Programs

From: GLG 110 Assessment Committee
Thomas G. Plymate, Chair
Melida Gutierrez
Erwin J. Mantei
James F. Miller
Thomas D. Moeglin

Subject: Assessment of GLG 110: Principles of Geology

Enrollment data for all sections of GLG 110 offered during the past three academic years are provided in Table I. The new CGEIP Oversight Table showing the correlation of the GLG 110 course goals to the General Education goals is included as Table II. The original proposal to include GLG 110 in the new General Education program is included as Appendix A. Policy Statements and Course Outlines for all sections of GLG 110 taught during Spring 2004 are provided in Appendix B. A revised Policy Statement for GLG 110 explicitly outlining the relationship between the course and General Education goals, to be used beginning Spring 2005 (pending CGEIP approval), is included as Appendix C. The current version of our GLG 110 assessment instrument is included as Appendix D. Results of the GLG 110 assessment for the past two academic years are included as Appendix E.

INTRODUCTORY DESCRIPTION OF HOW GLG 110 CONTRIBUTES TO THE GOALS OF GENERAL EDUCATION

GLG 110 was proposed for inclusion in the new General Education program in Fall 1996. In that proposal (Appendix A) we described the "Instructional Goals of the Course" in section IV and the "Relationship of Instructional Goals of the Course to Goals of the SMSU General Education Program" in section V. Neither the course goals nor their relationship to the General Education goals has changes in any significant way over the past eight years. The GLG 110 course goals address 17 of the 27 goals of the SMSU General Education program. The new CGEIP Oversight Table showing the correlation of the GLG 110 course goals to the General Education goals is included as Table II. A revised Policy Statement for GLG 110 explicitly enumerating the course and General Education goals, to be used beginning Spring 2005 (pending CGEIP approval), is included as Appendix C.

DESCRIPTION OF ANY SIGNIFICANT CHANGES THAT HAVE BEEN MADE TO GLG 110 SINCE THE LAST TIME IT WAS REVIEWED AND WHY THEY WERE MADE

Since its inclusion in the new General Education program, we have monitored the success of GLG 110 using the assessment plan described below. We have not identified any significant weaknesses in the structure or basic curriculum of GLG 110 which can be strengthened given the physical, budgetary, and time constraints within which we operate. We continually "fine tune" the content of GLG 110 to keep it current and relevant (for example, by incorporating discussion of recent earthquakes, volcanic eruptions, and other geologic events in the news, particularly as they relate to public affairs). However, none of this fine tuning represents fundamental change to the basic curriculum of this course. In fact, the structure and basic curriculum of GLG 110 remain essentially identical to that approved for inclusion in the new General Education program in 1996. The current course outlines for

both the lecture and laboratory sections (Appendix B) are virtually identical to those submitted to CGEIP in Fall 1996.

We have made some significant changes over the past eight years to the manner in which we deliver our lectures. Most of the GLG 110 lecture instructors are now using PowerPoint and Internet notes. One of our GLG 110 lecture instructors (Mantei) has even published a paper on the benefits of these new instructional technologies for introductory geology courses.

We have changed the title and catalog description of GLG 110 from...

GLG 110 Physical Geology. 4(3-2) F,S. Partially fulfills the General Education requirement for Understanding of the Natural World. An introduction to the study of the earth. Topics include minerals and rocks; dynamic internal processes including volcanism, earthquakes, plate tectonics, and mountain building; and surficial processes associated with streams, ground water, glaciers, wind, and shorelines. Laboratory instruction in identification and classification of common minerals and rocks; introduction to the identification of landforms as interpreted from topographic maps. Optional weekend field trips.

to...

GLG 110 Principles of Geology. 4(3-2) F,S. How Earth works. The building blocks of Earth: minerals and rocks. Earth's dynamic interior: plate tectonics, earthquakes, volcanism, and mountain building. Surface processes associated with streams, ground water, glaciers, wind, and shorelines. Laboratory instruction in identification of common minerals and rocks, the use of topographic maps, and landform identification from topographic maps. Optional weekend field trips.

These changes were made to present the course using more attractive, less threatening, language. They do not represent any significant change to the content or structure of the course.

DESCRIPTION OF PLANS FOR ANY FUTURE CHANGES, WHAT THEY ARE AND WHY

Since its inclusion in the new General Education program, we have monitored the success of GLG 110 using the assessment plan described below. We have not identified any significant weaknesses in the structure or basic curriculum of GLG 110 which can be strengthened given the physical, budgetary, and time constraints within which we operate. Therefore, we have no current plans to change the structure or basic curriculum of this course. However, we intend to continue to monitor GLG 110 through this assessment plan and will address any weaknesses should they appear.

STATEMENT ABOUT HOW THE COURSE'S ASSESSMENT PLAN HAS BEEN USED TO MEET GEN ED GOALS, MAKE CHANGES, AND IMPROVE THE COURSE

Development of the Assessment Plan

GLG 110 was proposed for inclusion in the new General Education program in Fall 1996. That proposal (Appendix A) included the following statement concerning course assessment:

At the end of each semester all students will be asked to evaluate the course. In addition to the standard questions provided on the unified Course Evaluation Form, we will add specific questions asking the students for their perception of how effectively this course enhanced their information-gathering, reasoning, and synthesizing abilities, their reflective, creative, and critical dispositions, their communication skills, their understanding of the natural world, and their understanding of culture and society. The faculty member in charge of coordinating GLG 110 will compile the results of these questions and will monitor variations from section to section and through time.

In Fall 1997 the faculty members teaching GLG 110 met to discuss the assessment issue in greater detail. We decided we wanted something more structured and formal than what had been proposed originally. We formed the GLG 110 Assessment Committee, the membership of which has remained unchanged to the present. The committee developed a pre-test/post-test assessment instrument containing both survey questions (attitudes and expectations) and factual questions about the content of the course. In response to the CGEIP review of GLG 110 in Fall 2001, we slightly modified this assessment instrument by clarifying a few of the original questions and adding a few additional questions. The current versions of this instrument (both pre-test and post-test), which have remained unchanged since Fall 2002, are included as Appendix D.

Administration of the Assessment

We administer the assessment pre-survey and pre-test (Appendix D-1) during the first week of the semester, during the first meeting of each laboratory section. We administer the assessment post-survey and post-test (Appendix D-2) during the final exam period in each lecture section. The chair of the GLG 110 Assessment Committee (Plymate) collects and compiles the data.

Results of the Assessment

Results of the assessment of fourteen sections of GLG 110 for the past two academic years are displayed in Appendix E (Figures 1 through 16) and summarized below. These data include sections taught in each of our three standard formats (three 50-minute lectures plus one 110-minute lab per week, two 75-minute lectures plus one 110-minute lab, two integrated lecture-laboratory sessions per week in the evening) and in each of the three semesters (fall, spring, summer).

Part I: Attitudes and Expectations

Part I of the pre-test/post-test instrument was designed to assess the students' attitudes and expectations for this course as it relates to the aims and goals of the General Education program.

Questions 1, 3, 5, and 7 were designed to assess the students' attitudes concerning the specific aims and goals of the General Education program which GLG 110 was designed to address. As Figures 1, 3, 5, and 7 of Appendix E illustrate, our students consistently professed to have good, positive attitudes (>2.5 on a 4-point scale) with regard to these issues upon entering GLG 110. After completing the course, their attitudes with regard to these issues were generally even slightly more positive.

Questions 2, 4, 6, and 8 were designed to assess the students' expectations concerning the specific aims and goals of the General Education program which GLG 110 was designed to address. As Figures 2, 4, 6, and 8 of Appendix E illustrate, our students consistently professed to have high expectations, and our course consistently met or exceeded those expectations.

Part II: Factual Knowledge

One of the primary goals of GLG 110 as a component of the General Education program is to increase the students' understanding of the natural world by increasing their factual knowledge of the basic principles and general facts of geology. Questions 9 through 58 (Part II) of the pre-test/post-test assessment instrument were designed to assess this factual knowledge. These questions were selected by the committee primarily from two sources: comprehensive final exams used in introductory geology courses at other institutions and test banks provided by publishers of introductory geology textbooks.

Figures 9 and 10 of Appendix E summarize the overall results of the pre-test/post-test assessment of the students' factual knowledge of the subject matter of GLG 110. On the pre-test, the students consistently answered between 30% and 40% of the questions correctly. On the post-test, the median scores were consistently between 50% and 70%. This indicates remarkable improvement! To quantify this improvement, one must realize that these instruments utilize 5-answer multiple-choice questions. After subtracting the score expected for random guessing (20%) from both the pre-test and the post-test results, one can calculate the percentage improvement by dividing the difference by the pre-test score for each section. The right-hand column of Figure 10 lists the results of these calculations. Overall, the average improvement (weighted for the number of students in each section) is 355%! In other words, as a result of taking GLG 110, the average student's factual knowledge of the basic principles and general facts of geology has more than quadrupled!

Questions 9 through 58 can be grouped into subsets according to the six general subject areas covered in an introductory geology course:

- Subset 1—Earth Chemistry and Mineralogy
- Subset 2—Volcanoes, Igneous & Metamorphic Rocks
- Subset 3—Weathering, Sediments, & Sedimentary Rocks
- Subset 4—Earth History
- Subset 5—Earthquakes, Plate Tectonics, & Structural Geology
- Subset 6—Geomorphology

Figures 11 through 16 of Appendix E present the results for the pre-test/post-test assessment for these six subsets, respectively. Our students consistently appear to show a significant increase in their factual knowledge in each of these six areas.

How the Assessment Data Have Been Utilized

The GLG 110 Assessment Committee continually monitors the results of this assessment to check for any significant variations between sections which might be attributable to differences in instructor ability or instructional styles or class formats. We have detected none.

The GLG 110 Assessment Committee also monitors the performance of our GLG 110 students on the six subsets of factual knowledge covered by the course, to see if there are any relative weaknesses in the course curriculum. For the first three years of the assessment, we noticed that our students consistently scored higher on the subsets of factual knowledge taught during the latter half of the course (Earth History; Earthquakes, Plate Tectonics, & Structural Geology; Geomorphology) than on the subsets taught during the first half of the course (Earth Chemistry and Mineralogy; Volcanoes, Igneous & Metamorphic Rocks; Weathering, Sediments, & Sedimentary Rocks). From speaking with former GLG 110 students, particularly ones who had gone on to become geology majors, we suspected this discrepancy represented an artifact of our assessment procedure rather than an inherent weakness in our course. To test this hypothesis, we modified our course grading policy to try to give our students some motivation to review the content presented during the earlier parts of the course before taking the post-test assessment. We now allow each student to substitute his/her score on Part II of the assessment post-test (the fifty factual-knowledge questions) for his/her lowest lecture exam score (except for the lecture exam given during the final exam period). This change in assessment procedure completely eliminated the apparent discrepancy in performance on the factual-knowledge subsets, and it had the additional benefit of more than doubling the apparent increase in overall factual knowledge of geology resulting from this course (from 127% for 1998-2001 to 355% for 2002-2004)! We have no delusions that this change represents a significant increase in student learning in this course, but we feel this new way of measuring the increase in our students' knowledge of geology is a more accurate reflection of the "value added" by GLG 110.

GLG 110 was already a “highly evolved” course before it was proposed for inclusion in the new General Education program. Each of the senior faculty members who teach GLG 110 (Gutierrez, Mantei, Miller, Moeglin, and Plymate) has taught this course for more than a decade. Long before course assessment was mandated by the new General Education program, we were informally assessing GLG 110 on a regular basis, and we fine-tuned the course structure and curriculum correspondingly. We are committed to continuing to update this course in response to new geologic discoveries and technological advances. However, the current assessment has not suggested any specific weaknesses in the structure or basic curriculum of GLG 110 which can be strengthened given the physical, budgetary, and time constraints within which we operate. We therefore feel we should refrain from trying to fix something that doesn’t appear to be broken.

STATEMENT DESCRIBING HOW THE DEPARTMENT ENSURES THAT ALL FACULTY TEACHING THE COURSE, INCLUDING PER-COURSE AND GRADUATE ASSISTANTS, UNDERSTAND AND INCORPORATE GENERAL EDUCATION GOALS INTO THEIR SECTIONS

We offer three lecture sections and eleven or more laboratory sections of GLG 110 each semester. We also offer an integrated lecture/laboratory section each summer. Nonetheless, we have always treated GLG 110 as a single, unified course. We use the same textbook for all lecture sections offered each academic year, and we have written a “laboratory coursepack” which is used in all laboratory sections.

There are only five individuals who teach lecture sections and serve as “instructor of record” for GLG 110: Gutierrez, Mantei, Miller, Moeglin, and Plymate. All five of these individuals are senior faculty, each with more than ten years experience teaching this course. Each lecture instructor writes his/her own Policy Statement and Lecture Outline for his/her lecture section, but we work closely to ensure that the basic policies are consistent among all lecture sections and that the presentation of lecture topics dovetails consistently with the presentation of the complimentary topics in the laboratory sections. All five of these senior faculty members were involved in developing the proposal that resulted in inclusion of GLG 110 in the new General Education program in Fall 1996 (Appendix A). All five of these senior faculty contributed to the discussions that led to defining the “Instructional Goals of the Course” and the “Relationship of Instructional Goals of the Course to Goals of the SMSU General Education Program” included in that proposal.

We use a single, uniform Policy Statement and Laboratory Outline for all GLG 110 laboratory sections, regardless of laboratory instructor. Each semester, the graduate assistants teaching laboratory sections are closely supervised by one of the senior faculty members who is teaching a GLG 110 lecture section that semester. On the rare occasion we have hired a per-course instructor to teach a section of GLG 110 lecture (such as section B in Fall 2003 as sabbatical replacement for Plymate), we insist that individual use the same Policy Statement, Lecture Outline, and lecture notes as the senior faculty member he/she is replacing.

xc: Dr. James Skinner, Head
Department of Geography, Geology, and Planning