ASSESSMENT OF STUDENT LEARNING
Department of Geology
University of Puerto Rico at Mayaguez

Progress Report

Period of Report

January to May of 2006

Purpose of the Assessment

During this semester we worked toward closing the loop of assessment for student learning. The main activities were focused on the learning of geochemistry.

Skill to be Measured

According to the Assessment Plan of the Geology Department it is crucial to assess the impact of our curriculum for reaching the mission and producing students that fulfill the proposed profile. Therefore, we have assessed our current curriculum in order to determine what modifications, if any, are necessary. The three major evaluated areas are (1) skills and values, (2) scientific knowledge, and (3) overall performance. Based on the data collected during the past year our curriculum must be more effective on developing the scientific knowledge. Figure 1 shows that 25% of the students in December 2005 and 20% of the students in May 2005 indicated that the effectiveness of our curriculum in that area is poor or deficient.

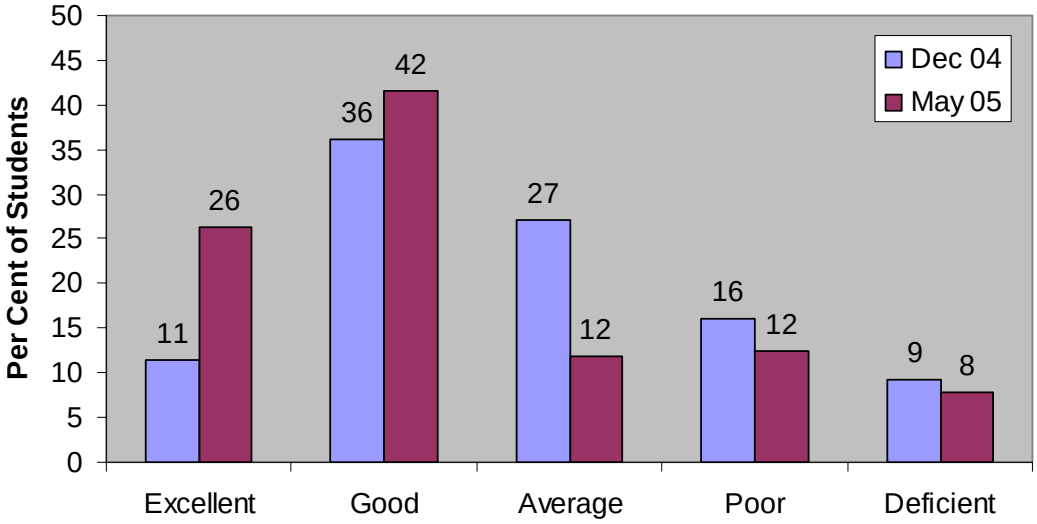

Figure 1: Effectiveness of the Geology Department curriculum in developing scientific knowledge.

Based on these results we decided to choose scientific knowledge as the specific skill to be more carefully evaluated and develop tools for closing the loop of assessment.

Pre-Intervention

In order to assess more specifically the effectiveness of scientific knowledge in our curriculum we analyzed several specific fields. We found that 63% and 54% of the students interviewed in December 2004 and May 2005, respectively, consider that our curriculum is poor or deficient in scientific knowledge related with geochemistry. The results of the curriculum assessment were surprising because geochemistry is a very important area in our Department. Normally we have a professor in this field; however, during the time of our assessment the Department did not have a professor of geochemistry. This situation could have produced the general perception among the students that the Department is poor or deficient in that area. In August 2005, a new professor of geochemistry was hired and as part of his first graduate course in spring 2006 he developed a questionnaire to know the general knowledge in topics related to Petrology and Geochemistry. He found that the graduate students taking his class were not familiar or never heard of many important topics mentioned in the questionnaire. He was surprised with these results because many of these topics are covered in undergraduate courses taken by all major students in Geology.

Field Area	Dec 04	May 05
Paleontology	26	27
Sedimentology and Stratigraphy	0	13
Structure &Tectonics	15	20
Igneous and Metamorphic Petrology	7	20
Geomorphology and Quaternary Geology	4	13
Hydrogeology	44	27
Geophysics and Seismology	41	7
Environmental Geology	11	20
Geochemistry	**63**	**54**
Engineering Geology	44	13
Mineralogy	11	20
Geology of Puerto Rico	37	7

Table 1: Percent of students that consider as poor or deficient the effectiveness of the curriculum in developing the knowledge of specific fields in the Geology Department.

Intervention

These findings were detailed analyzed by modifying the same questionnaire prepared by the geochemistry professor and offers it to all our professors and a group of undergraduate seniors students. This activity allowed us to compare the offering of geochemistry related topics as part of the current courses according to the professors and the knowledge or perception of the students toward the same topics. Four main areas were selected with a total of 67 topics. The areas were: (1) phase diagrams/phase equilibria (22 topics), (2) thermodynamics (9 topics), (3) igneous/metamorphic petrology (26 topics), and (4) stable isotope geochemistry (10 topics). The senior students selected for this assessment were those registered in the advanced course called Caribbean Geology. According to the professors most of the topics are covered in current courses (Figure 2). But, the results demonstrate that more than 50% of the students consider that never heard of these topics or are familiar with them, but do not remember (Figure 3). The same students said that they know well less than 30% of the topics.

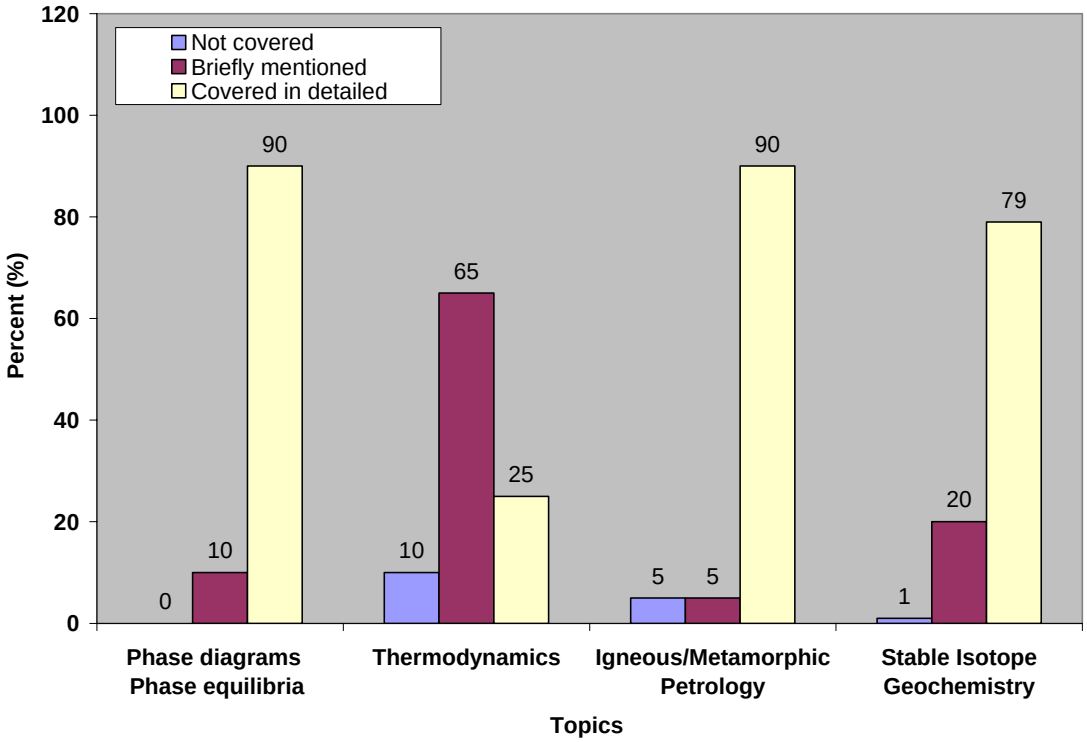

Figure 2: Coverage of the geochemistry topics in current courses according the professors.

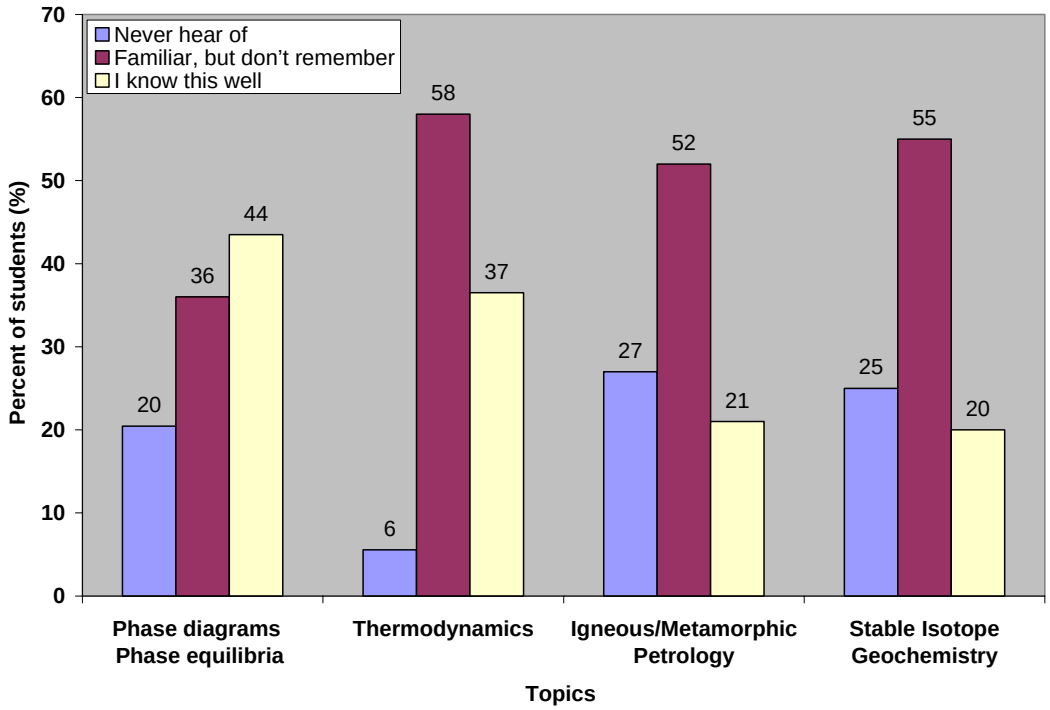

Figure 3: Knowledge of students about specific geochemistry topics.

Post-Intervention

During this semester, and after hiring in the Department a new professor of Geochemistry, we performed another assessment using the same questionnaire used in previous semesters. In order to evaluate the perception of students about this topic we compared the percent of students that consider as poor or deficient the effectiveness of the curriculum in developing the knowledge in Geochemistry (Figure 4). Only 25% of the students had that perception after hiring the professor, while previously this perception was in more than 50% of the students.

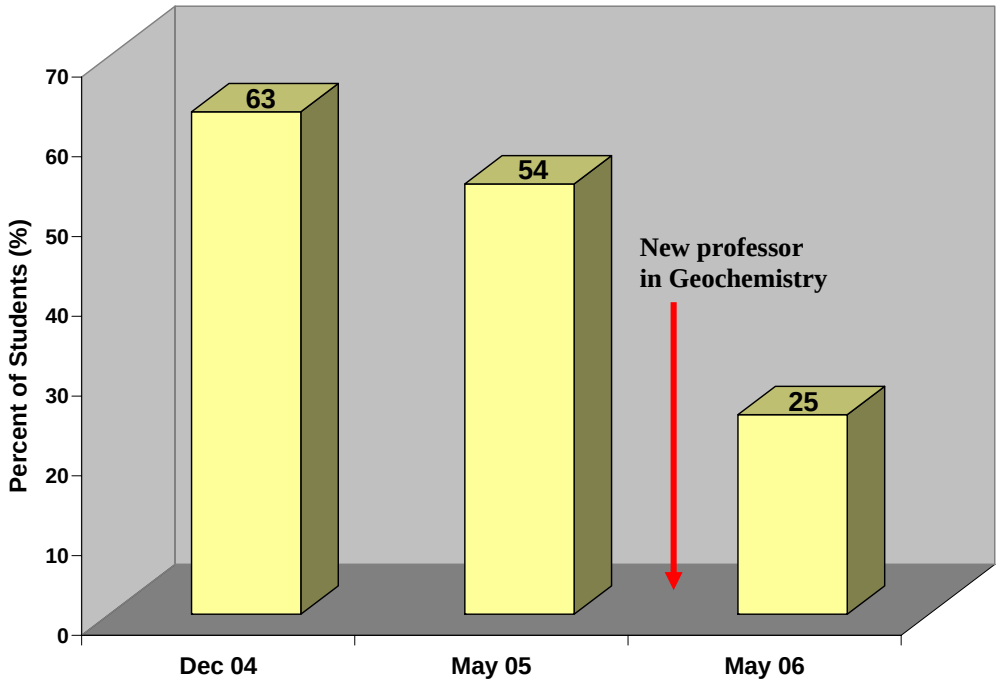

Figure 4: Percent of students that consider as poor or deficient the effectiveness of the curriculum in developing the knowledge of Geochemistry in the Geology Department.

Main Conclusions and Accomplishments

- We learned that our curriculum is strong in developing skills and values. But, scientific tools and techniques, and ethics must be improved.

- The curriculum is strong in sedimentology, stratigraphy, geophysics, seismology, geomorphology, and mineralogy. However, according to students it is poor or deficient in geochemistry.

- Additional assessments suggest that our deficiency in geochemistry is due to the wrong impression produced by lacking a professor in that area.

- In fall of 2005 we hired a geochemistry professor.

- Based on the assessments results we performed a specific assessment for geochemistry topics in spring 2006.

- We found that many geochemistry topics are part of current courses, but the students do not recognize them as part of their scientific knowledge in that specific area.

- Since there is not a specific course in geochemistry the students think they are not receiving that knowledge. The situation improved with the new professor in geochemistry.

- An undergraduate course in geochemistry will be offered in spring of 2007.

- We suggest selecting Geochemistry as main topic of a near future Geology Symposium.

Working Plan for Next Loop of Assessment

Skill to be measured: Every undergraduate student in the Department of Geology has to take two undergraduate research courses (Geol 4049 and Geol 4055). This experience must provide to the students the opportunity for applying their theoretical knowledge into research and to more practical applications to society. According to our profile, the Geology students must have research skills and the capabilities to apply their knowledge to the benefit of society. Therefore, our next assessment activities will be focused on determining the impact of the research experience over our students learning.

Pre-Intervention: During the past two years we have been collecting data using the questionnaire attached at the end of this report. These data will be processed and analyzed in order to determine the impact of the research courses over the students' knowledge and skills.

Intervention: Next semester will also collect data to better understand if the current structure of the research courses is the most appropriate. In recent years the amount of students entering to the Department of Geology has increase, and therefore the amount of students requesting to take the research courses per semester has also increase. This could represent a problem if the amount of professors can not cover the future demand. This concern is generating the idea among the faculty to change the curriculum and make only the first research course as requirement and the second as elective. However, before doing this change it would be important to evaluate the impact of such change and provide better recommendations. Other aspects to be evaluated are: time table for activities, like proposal, research, written report and oral presentation, the amount of students per professor, the most selected areas of research, and the comparison between the professors and students expectations.

Closing the loop: We will provide recommendations to improve the structure of the undergraduate research courses. This will give better research skills and scientific knowledge to the Geology students, making a strongest curriculum.

GEOLOGY UNDERGRADUATE RESEARCH

Student Information

Years at UPRM: _____

Major when admitted to UPRM: _____

Semester of Research: _____ Geol 4049 _____ Geol 4055

Description of Research Topic

How did you choose the topic? _____

The selected topic is related to:

___ Sedimentology
___ Volcanology
___ Geomorphology
___ Stratigraphy
___ Mineralogy
___ Petrology
___ Structural Geology
___ Seismology
___ Remote Sensing
___ GIS
___ Paleontology
___ Geophysics
___ Hydrogeology
___ Other: _____

Research Experience

In a scale of **1** (strongly disagree) to **5** (strongly agree) assess your experience in undergraduate research in geology.

Criteria	1	2	3	4	5
A well defined project with clear goals was assigned					
Faculty was accessible and helpful					
Learned the scientific method					
Applied knowledge from my geology courses					
Became exposed to new concepts					
Developed analytical skills					
The experience was challenging					
Improved my writing skills					
Improved my oral skills					
Gained confidence in my abilities to do research					

Would you be interested in continuing the same research in the future?

Yes _____ No _____ If not, why? _____

Comments concerning this research experience:

_____

_____