B.A., B.S. GEOLOGY PROGRAM ASSESSMENT 2007-2008

Prepared by: Dewey Sanderson, Chair

I. Program Goals

The BA/BS undergraduate program in Geology directly supports most of the basic tenets of the Mission of Marshall University. The program is designed to train graduates to 1) think logically, critically and creatively, 2) communicate ideas clearly and effectively in speaking and writing, and 3) recognize, analyze, and solve problems utilizing the most appropriate research methods available.

The Geology Department is committed to 1) high quality undergraduate education, 2) developing opportunities for undergraduate research, 3) maintaining a strong curriculum and rigorous standards that are relevant to the profession, 4) economic development through maintenance of a degree program in environmental geoscience and engineering geology, and 5) addressing environmental issues in service courses (e.g. water pollution, global warming), upper level courses (e.g. environmental geology, hydrogeology), and areas of emphasis (e.g. Engineering Geology and Environmental Geoscience).

Faculty within the department have supported training and enrichment for elementary and secondary schools by providing lectures, leading field trips, participating in collaborative research with high school students, and summer institutes in earth science for science teachers, judging for science fairs, and merit badge counseling for Boy Scouts.

As part of its mission as a liberal arts institution, Marshall University has an obligation to provide students with coursework and degree programs that cover natural sciences. Geology is in many ways the cornerstone of our society. Our way of life depends on geologic resources, and our ability to sustain mankind depends on a thorough understanding of how our activities impact the environment around us. The water, soil, air upon which we depend is primarily the product of ongoing geologic processes. Our society will continue to need earth scientists with a sound geologic background because of its continuing need for fossil fuels, metallic and nonmetallic resources, ground and surface water, and because of the need to manage increasing amounts of waste that will be produced by an ever-expanding , consumer oriented population.

Goals related to Student Academic Achievement: The goal of the program is to train students so that they will be successful in graduate school or as professional geoscientists. The program strives to ensure that all graduates have an opportunity to do one or the other, continue their education or enter the work force.

*Goals related to Faculty Development***:** Geology faculty must have the opportunity and support to conduct research, attend professional meetings, and participate in training workshops if they are to remain current and enthusiastic about their profession. The goal of the Geology program is to provide faculty with sufficient time and resources to be able participate in developmental activities. These activities help maintain faculty morale, enhance teaching effectiveness, and provide opportunities for increased scientific knowledge and its benefits to society.

Goals related to Curriculum Development: The B.A. and B. S. curricula provide a solid foundation in geology and allied sciences and mathematics. They are intended to provide a foundation of core courses with enough flexibility to meet a students specific interest or career track. Two areas of emphasis are now available that target engineering geology and environmental geoscience. Other course combinations can be used to prepare students for careers in oil, gas or coal exploration and production.

II. Learning Outcomes

Geology Major Outcomes

The B.A./B.S. Geology graduate should acquire the following competencies:

1. proficiency in technical writing
2. effective oral communication
3. critical thinking
4. computer competency
5. quantitative math skills
6. acquisition of basic data and knowledge in geology and allied disciplines
7. basic field skills
8. to work effectively in group projects

Technical Writing

Criteria:

-capacity to research the available literature using library and Internet sources, collect data in some cases, and critically and effectively synthesize the information into a well structured, logical analysis

- capacity to adapt final report to specific formats depending on application; in some cases the required format is that used in professional geologic journals.

- effectively use and manipulate & modify graphic materials including digital photos, graphs, maps and the like in research papers

Indicators:

Successful completion of upper level GLY courses with a significant writing component (GLY 325, 418, 427, 485-488, 491-492) and ENG 354, Scientific and Technical Writing (required for GLY areas of emphasis). Other geology courses with term papers include GLY 421 and 425.

Oral Communication

Criteria:

- capacity to express ideas effectively in oral form both informally and in formal presentations, in a manner that is clear, concise, well-informed and which takes nature of audience into account.

- Completion of CMM 103 Fundamentals of Speech Communication or demonstrated proficiency.
- PowerPoint presentations (GLY 430, 491-492)
- Oral reports in GLY 427

Indicators:
Grades on oral presentations, faculty discussions of capstone presentations

Results:
Three geology capstones were completed during the period and another was scheduled but not completed. Though the students received good grades from their advisor, some of the reports or presentations were not of high quality. One student had only the capstone to finish in order to receive his degree. Having let the completion of the capstone slide for almost three year, in which time he had to re-register for the course, he had forgotten some basic geology he had not used since leaving school for work. Another student who should have finished her capstone this past spring did not do so because of work and family needs is now out of state. She still plans to complete the capstone. Capstones in geology normally take more than one semester.

Actions:
It is clear that the Department needs to get better quality and time constraint controls on its capstone experience. Recent capstone presentations have been rushed, disorganized, and of less than desired quality. These are used as part of program assessment. Other departments in our division have more rigorous guidelines that are posted on their department web page. The department has nearly completed a policy document on our capstone. The draft of it is in the appendix of this report. This document has undergone several revisions. One section that is currently being added is on grading.

Proposed changes (effective beginning Spring 2007)

1) -require formal capstone proposal to be submitted by student (title, scope, significance, methods, previous work) and approved by all geology faculty
2) - identification of GLY advisor
3) - assign ultimate responsibility for compiling capstone grade to advisor
4) - require that a syllabus be issued to each capstone student during the first week of classes that spells out
5) Base capstone grade on following weighted elements:
   a) 50 % written report (average of numeric scores from 2 faculty using standardized criteria; in case of field camp, 50% based on final grade received for field camp)
   b) 40 % oral (and/or poster) presentation (average of 2 faculty scores using standardized criteria (ex. organization, clarity, comprehension of geologic principles and application, ability to handle questions, evidence of critical thinking, use of PowerPoint or other presentation software)
   c) the ACAT exam will no longer be factored into the capstone grade
6) Eliminate capstone presentations during summer due to limited availability of faculty (all are on 9 month contracts) and limited student audience.

Critical Thinking

Criteria:

-Capacity to carry out lab and field projects, exercises (314, 423, 427, 451L, 456L, 487, 491- 492) involving collection, analysis and interpretation of data.
- Ability to effectively respond to questions regarding their research from an audience of faculty and students follow-up to capstone presentations.
- Ability to evaluate the validity of results and interpretations of others
- Capacity to seek out previous work relevant to a particular geologic problem and apply available information to a solution or interpretation.

Indicators:
- successful completion of upper level GLY coursework, all of which include a significant lab/field component.
- completion of independent studies (GLY 485-488)
- completion of capstone project including written report and oral presentation.
- feedback from employers
- presentation of capstone results to Research Day and meetings

Results:
Completion of 3 Capstone Projects (see Oral Presentation-Results)

Computer Competency

Criteria:
-use of email
- use of online databases for imagery, maps and data archives
-use of scanners; annotation, integration of graphics into reports (all upper level courses)
-use of Word for report writing (all upper level courses)
-use of Excel for Data Management and Statistical Analysis (GLY 427, 430, 455)
-use of PowerPoint for Oral Presentations
-use of Internet for Research (all upper level GLY courses)
-use of Surfer for Map Making (GLY 212, 430, 455, 455L)
-use of Rockworks for Stratigraphic and Structural Analysis (GLY 325, 427)
-completion of GLY 430, Computer Methods in Geology

Indicators:
-successful completion of upper level geology courses
-feedback from employers

Quantitative math skills

Criteria
-Capacity to carry out field projects, lab exercises and problem sets (212, 313, 314, 325, 421, 423, 425, 430, 457, 487, 491- 492) involving collection, analysis and interpretation of data
- use of geometry, trigonometry, statistics and algebra to analyze geological problems

Indicators
- successful completion of projects, exercises, problem sets and passing tests

Fundamental and relevant knowledge in Geology and allied sciences

Criteria:
-comprehension of the structure and composition of the earth, geologic processes and their products, earth origin and history, as well as relevant aspects of physics, biology, chemistry, and mathematics.
-knowledge of sufficient breadth and depth to be employable and certifiable (in those states that use CPG system) as a professional geologist

Indicators:
- Hiring of internship students to full time positions upon graduation
-Completion of geology curriculum
-Acceptance into graduate school or entry level geology position
-Employer feedback
-Course embedded testing (GLY 110, 150, 200)

Results:
Three geology students graduated with BS degrees during the 2006-2007 year with an average overall GPA of 2.73 with a range of 2.59-2.90. As of the writing of this report there are three students to be graduating this fall semester and several to be graduating this coming spring semester. These graduates will, of course, appear on next year's annual report.

Results of course assessment testing:

FALL 2007

Semester	Course	Faculty	# students beginning	Entrance	# students end	Exit	score diff	% improvement
200701	110/101	WLN	65	42.23	55	65.73	25.69	56
200701	110/102	DDS	68	40.96	63	52.94	28.01	29
200701	110/103	AELS	37	41.49	25	68.20	18.07	64
200701	200/101	RLM	43	49.88	35	73.86	19.9	48
200701	150/101	DDS	18			*NA		

*NA Exit Exam not given

Spring 2008

Semester	Course	Faculty	# students beginning	Entrance	# students end	Exit	score diff	% improvement
200702	110/201	DDS	67	42.39	66	50.98	25.69	20
200702	110/202	AELS	59	39.58	41	66.95	28.01	69
200702	110/203	WLN	44	40.80	38	66.71	18.07	64
200702	200/201	RLM	52	49.88	42	73.86	19.9	48

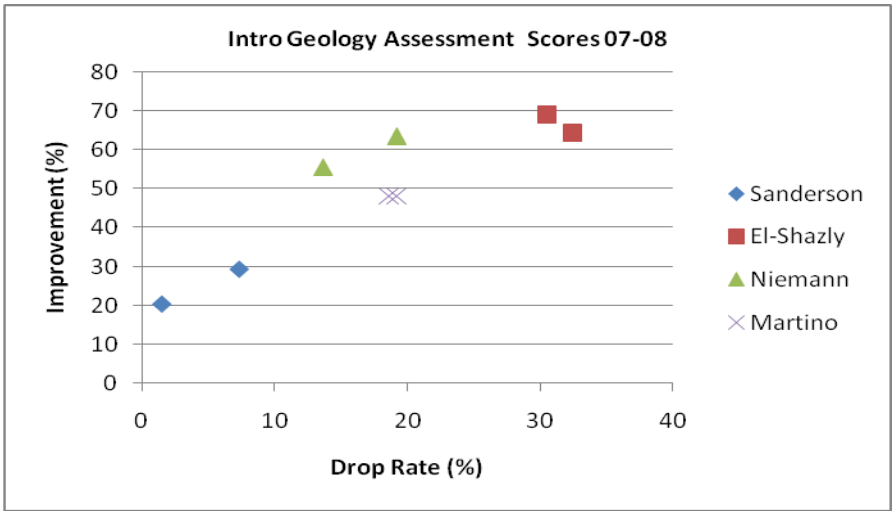
SUMMER 2008

Semester	Course	Faculty	# students beginning	Entrance	# students end	Exit	score diff	% improvement
200707	110/701	RLM	16	45.00	15	72.67	27.67	61
200708	ISC204	DDS	17	35.29	14	63.90	28.61	81

* Basis of calculations: ((Exit-Entrance)/Entrance)x100 This is a comparison of what the student knew at the end of the course compared to what was known at the beginning of the course. To insure that students take the assessment tests seriously, a percentage of what they make on the test is added to their first and final test scores.

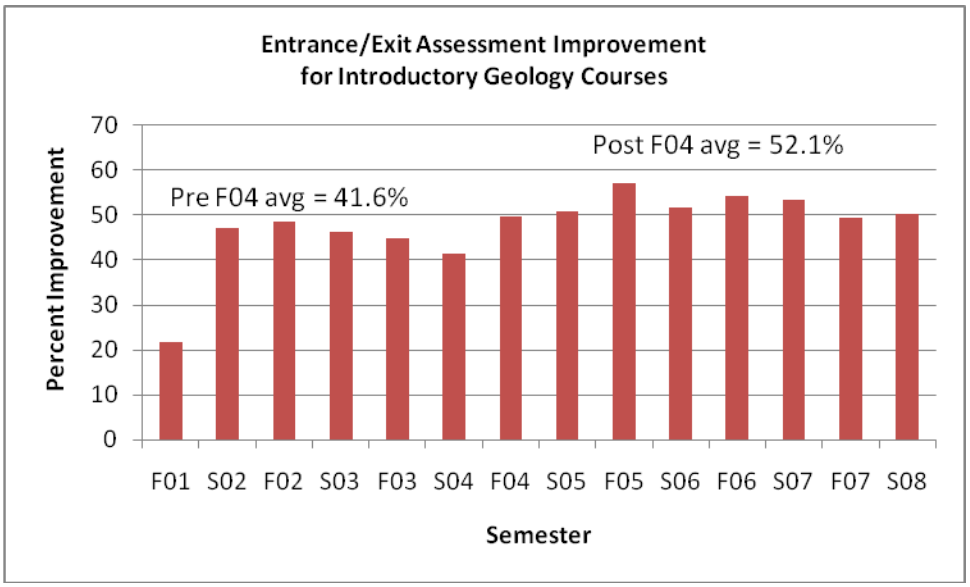
These results show significant gains in basic knowledge of geology. Most GLY majors take GLY 200 as their first geology course. These results also show significant differences among the sections. There could be several explanations for this. Results can be expected to vary on whether a final is comprehensive. If the final is not comprehensive, but only covers the last section of the course, then students are not likely to study earlier material and consequently not do as well on the exit exam. All sections of 110 and 200 are taught using PowerPoint. GLY 150 is now taught with PowerPoint. Previously, when both chalkboard and PowerPoint were used, students were polled as to what they what they preferred and like better, PowerPoint or chalk board. The class was equally divided in their response between the two types of presentations. The exit exam was forgotten to be administered in Fall 2007. I have found that teaching my ISC course in the spring semester and in session A that students do better in the shorter summer term. This is also the case with Dr. Martino who has in the fall and spring semesters and summer session.

There is a wide range of improvement based on the entrance/exit score comparisons. In an attempt to determine a possible explanation a plot was made from the data in the above tables using percent improvement versus percent drop rate for all four faculty.



There appears to be a marked relationship between drop rate and improvement. Student drop courses for many reasons including financial, medical, military, and family/relationship problems and also because they are not doing well in a course. The first four reasons are not likely to surface more in one faculty's class as in another. It is known that El-Shazly is more demanding and has higher expectations than Sanderson. Those student not doing well are more likely to drop and consequently the exit exam score will reflect the better students remaining in the class. The ideal situation is to be highly effective (high improvements) and high retention.

The department has been compiling entrance/exit exam results since the fall of 2001. To see if there has been any change over time the average improvement for all introductory courses each semester has been compiled and plotted as shown below.

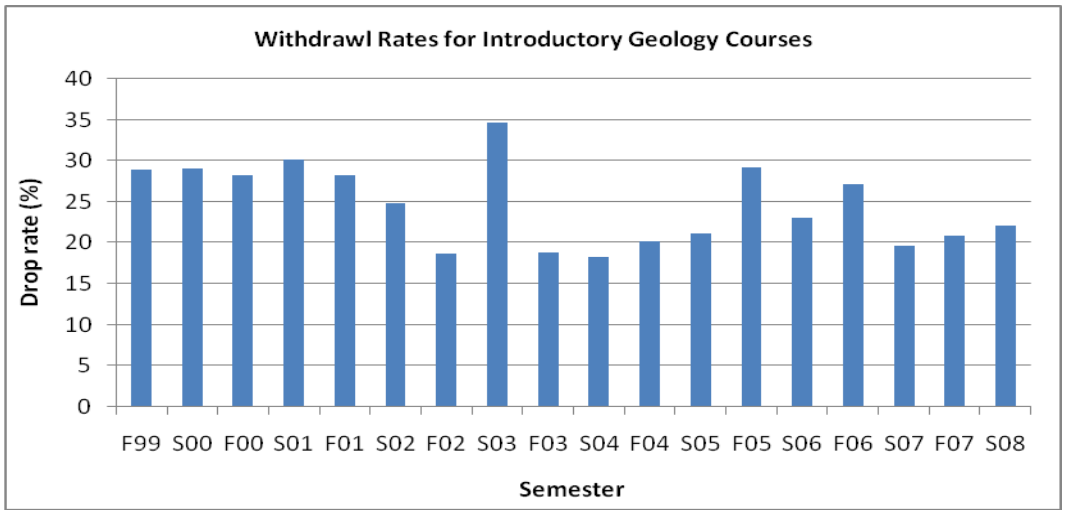


The summer session data was not included in the plot. The department only offers one introductory geology class each summer school and one ISC class so its inclusion does not carry the weight of the fall and spring semester.

The data in the plot is broken into two sections, F01 – S04 and F04-S08. The reason for this is the addition of two new faculty to replace two retiring faculty so it was interesting to see if the new faculty has resulted in an improvement in learning outcomes. It appears to have done so; the values listed on the plot show a nearly 11% gain. This improvement is likely do to a combination of younger faculty who are more dynamic, older faculty who were getting ready for retirement and had lost some of their enthusiasm for teaching and new techniques employed by the new faculty. All of the current faculty use PowerPoint instead of the chalk board, make PowerPoint presentations and notes available on the web or by email, give quizzes and give different kinds of extra credit activities including field trips. When the data assessment was first collected, the classes were taught as chalk/talk and field trips. The use of technology and requiring more of the students have apparently been successful. There is a drop of a few percent over the past three years. There is not enough data to know if this is a trend or not, but it does deserve watching.

An indicator of the department's success in retaining students is to look at the withdrawal rates of its classes. This is also a parameter of keen interest to the university as a whole. Withdrawal from individual courses may in fact be withdrawal from all classes and the student leaving the university completely and not returning. Withdrawing from a class can be for a number of reasons including reasons including, financial, doing poorly, the subject matter not being what it was thought to be, a personal crisis situation, medical, military and others as well.

Data were compiled from BERT over the past nine years by semester and plotted on the following bar graph. The chart below is for the department's introductory courses, general geology (Gly 110), physical geology (Gly 200), earth materials laboratory (Gly 210L) and oceanography (Gly 150).

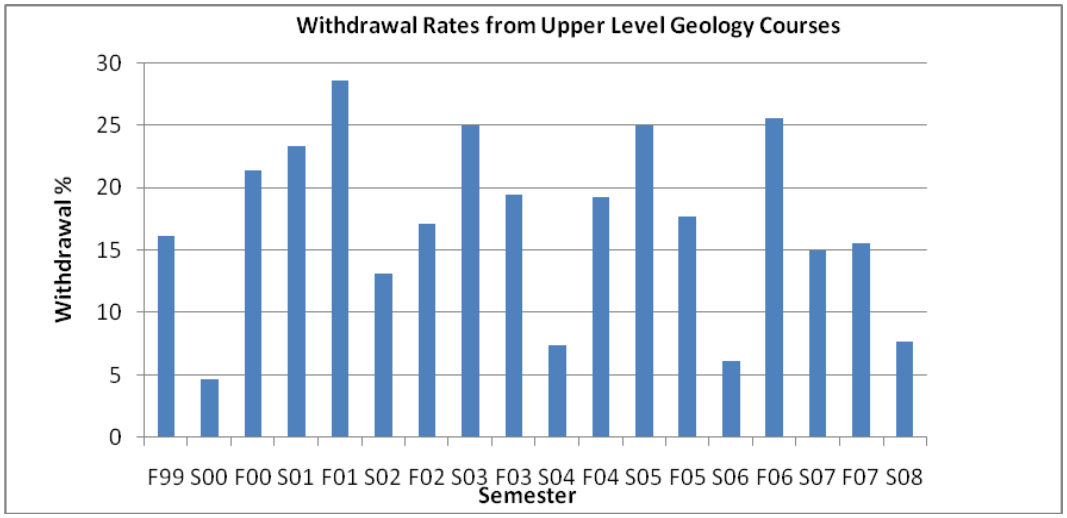


In general there has been a decrease in the withdrawals over time. This can be more clearly seen by computing the averages for the pre-F04 and post-F04 time intervals as done above with the assessment scores.

	Gly 110	Gly 150	Gly 200	Gly 210L
Average (all semesters)	23	20	24	28
Pre-F04	24	22	27	31
Post F04	23	14	21	25

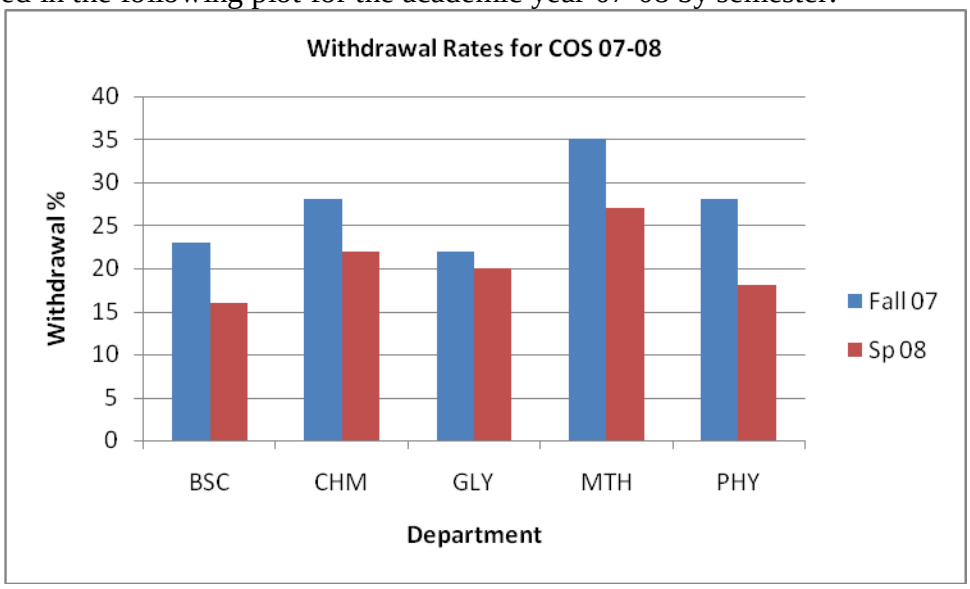
The best retention rate is for oceanography and the poorest is for earth materials lab. Some of the loss for the lab is due to students finding out the lab is not required by the Geology Department and may not be required by their college which has a 7 or 11 science hour requirement. Once again, as with assessment, there is an improvement in the retention with the addition of the new faculty in F04.

Retention/withdrawal rates were also compiled for the upper level geology that are primarily taken by geology majors. These include the 300-400 level courses. Included in this compilation is mapping (Gly 212).



The overall withdrawal rate is 18% with no difference for the pre-F04 and post-F04 periods. Apparently the faculty change made no difference. There has been the implementation of PowerPoint by some faculty in the upper division classes, but it does not lend itself as well for courses that are quantitative. The retention in the major courses is better than that for the non-major courses. Majors come through the introductory course but their percentage is small compared to the non-major students.

To see how the Geology Department is doing compared to other science departments, the introductory course withdrawals for biological sciences, chemistry, physics and math were compiled and compared. These four departments and geology are displayed in the following plot for the academic year 07-08 by semester.



It is seen that geology is neither significantly better nor worse than biological sciences, physics or chemistry in loss of students from their respective classes. Math, not surprisingly, has the highest withdrawal rate of these five departments. There is a consistent higher rate of retention in the second semester of the year. This may well be

due to the high rate of freshman attrition by the end of the fall ssemester. For departments other than geology, there is a 6-10% decrease in the drop for the spring semester but in geology, the drop is only 2%. Geology's withdrawl rate decreased from 23.5% in the 06-07 academic year to 21.0 % in this reporting year.

The only nationally normalized exam currently available for assessing undergraduate programs in Geology is the ACAT. This exam has been available at least as far back as 1995, though this fact was not discovered by our department until 2003. The ACAT (Area Concentration Achievement Tests) is produced by Austin Peay University.

The ACAT exam has two serious shortcomings. There are only 14 schools out of a potential several hundred that could participate in the Geology ACAT exam (see Table).It is difficult to say what the national norm really is since such a small percentage of the geoscience programs in the U.S. participate. The second issue involves the exam itself. The treatment of various subject areas is uneven and a number of questions used on the exam are ambiguous or have no correct answer. At the time of this report, the number of geology departments taking the exam has not increased. The subject areas of biology and sociology each have over 100 departments taking their exams.

Table 1 in the appendix indicates those institutions administering the ACAT in each geologic discipline during at least 1 of the most recent 6 years. These institutions are include in the reference groups that were used to evaluate the performance on the ACAT in Spring 2005.

Our program began implementing the ACAT exam beginning in Spring 2004. The original policy required that all seniors take the ACAT exam as part of their capstone requirement. Their performance relative to the national average counted toward 20 % of their capstone grade. Four students were given about 4 weeks notice and each instructor provided a 2-3 hour review session in their areas of specialization. Most of the students did not take advantage of the review.

- goal is to perform at or above national average at least in core areas (i.e. required courses)
- preliminary results (4 students) from the 2005-2006 academic year showed an average performance in core areas at the 36%ile which represents a 3% loss over the previous year. This decrease is unlikely significant due to the wide range of scores and the small sample group.

a) significant weaknesses in core areas:

Subject	Percentile
Geomorphology	20
Historical Geology	41
Structural Geology	20

b) near average performance in core areas:

Mineralogy	40

Physical Geology 37

c) significant strength in core area:

Stratigraphy 57

b) possible contributing factors to weak performance:

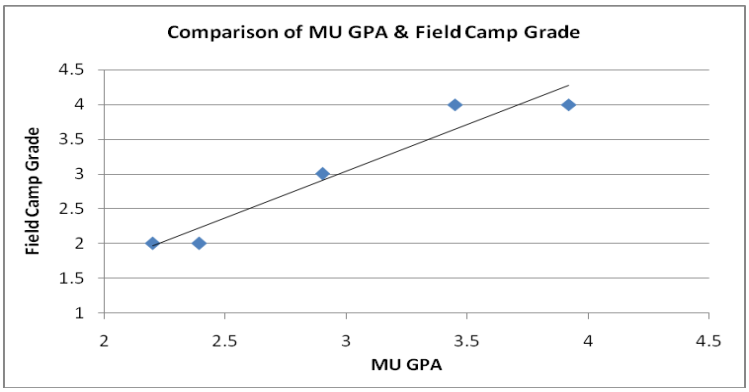
- short notice ~ 4 weeks in Spring 2004
- limited weight assigned to capstone (10%)
- many students take > 4 years to get through program; may have forgotten much of the information from courses taken more than 2 years ago.
- teaching effectiveness varies among faculty
- course content versus test content
- peer schools
- course content may not correspond well with exam content for a given subject (ex. Historical Geology: history of geology emphasized by previous instructors rather than earth history)
- students do not have time to prepare for the test due to other course work and their jobs

c) action: The department has decided to eliminate the ACAT as an assessment. When we adopted, we were hoping it would become a national standard, but the number of schools taking it has not increased. Last year none of our students took the ACAT but our department's name is still on their website. One might well ask if some of the other schools on the list actually are still taking the geology ACAT.

Since the dropping of the ACAT is a decision this semester, we wanted to be able to have some alternative assessment to take its place. We have compiled a list of sixteen schools of comparable size geology departments from the surrounding states whom we will be contacting as to what assess tool(s) they use for their programs. A questionnaire has been prepared that will be administered over the phone. An email survey is not likely to have a high rate of return. It is believed that a person-person phone contact will be most productive. The questions could be answered in five minutes. To date this survey has not been implemented.

An instrument, new to this year's reporting, that can give a measure of how Marshall's geology students compare to those of other universities is through our summer field camp option. Approximately six years ago an alumnus of our department, Robert Fox, donated money to the geology department through the Marshall Foundation for the purpose of providing a scholarship to a geology major to attend an accredited university's geology field camp. To date we have had five students awarded this scholarship. The competitive scholarship does not completely cover all expenses, but it does provide a sufficient amount to make it attractive. We have promoted it and those students who have experienced field camp have benefited greatly..

The graph below compares the grade received from the field camp to the student's Marshall GPA. A trend line is included in the plot. Fortunately, we have had students with a range of Marshall GPA's who have participated in a field camp.



There is clearly a direct relationship between performance here at Marshall and how the student performed in another university setting. The schools selected by our majors for their field camps include Southern Illinois University, University of Hawaii, University of Nevada, Bowling Green State University and Indianna University. These are schools that have geology deparments at least twice as large as our department and they recruit students from universities all across the country for their summer field camps. The field camp experience draws upon the fundamentals of many geology courses taken by any geology major. Our top students do just as well in a mix of students from across the country. Our average students are average among other geology students. None of our students have had their application for field camp denied.

Faculty Development

Goals:

-active research program
-effective, updated, enthusiastic course delivery

Indicators:

-attendance/participation at CTE workshops and presentations
-attend professional meetings with Quinlan support
-new course development or revision
-Use of technology in teaching and research
-participation in workshops and professional meetings
-Publications in refereed journals
-Grant Applications Submitted/ Grants Awarded
-Course Evaluation

Results:

During 2007-2008, faculty were involved in:

-Unpublished, funded research for the U.S. Army Corps of Engineers
- Consultation
- Grant writing: $50,000 PRF grant obtained for 2004-2007
- Present papers at national meetings
- A trial, Hedrick funded, field camp was offered in summer 2008

Student Course Evaluations (N= 530) for Fall 2007 and Spring 2008)
Out of the 22 questions asked on the evaluation form, five were selected to represent teaching effectiveness. Since there was a change in the evaluation questions three years ago, earlier data is not included
The values reported are the combined responses of 1 and 2 or excellent and good.

Year	04-05			05-06			06-07			07-08		
Question	GLY	COS	% diff.	GLY	COS	% diff.	GLY	COS	% diff.	GLY	COS	% diff.
8	91	85	6	83	86	-3	88	84	4	85	86	-1
11	86	88	-2	84	89	-5	89	87	2	88	86	2
12	90	87	3	86	89	-3	86	86	0	88	88	0
21	90	86	4	85	88	-3	88	89	-1	88	85	3
22	87	80	7	78	81	-3	82	80	2	80	77	3

8 I believe I learned in this course
11 The instructor was enthusiastic about the course material
12 The instructor encouraged students to ask questions
21 The instructor seemed genuinely interested in wanting me to learn
22 I would recommend this instructor to other students

In addition to the responses tabulated for the department, the College of Science averages are also included for comparison. It appears that the best response to the instructor evaluations was in the 04-05 school year, the year in which the department hired two new faculty. The 05-06 year fell significantly below the college average. The new faculty were already onboard, so to speak, so the decline cannot be attributed to a change in faculty. There was a return to averages generally above the college averages for the 06-07 and 07-08 academic years.

Use of technology

- PowerPoint lectures are used in GLY 110, GLY 200, GLY 201, GLY 423, and GLY 427 and in the ISC 204 course
- A variety of subject specific software is used in upper level GLY courses
- Personal websites are used for making available PowerPoint presentations, class notes and solutions to lab exercises and tests.
    - http://www.science.marshall.edu/elshazly
      http://www.science.marshall.edu/niemann
      http://www.science.marshall.edu/sanderso

Actions:

Half of the full time faculty were replaced in the 04-05 academic years due to retirements. Dr. Niemann was hired as a tenure track associate professor with expertise in environmental geology and engineering geology. He also be teaches geomorphology. Dr. El-Shazly, who was originally hired as a temporary full-time faculty member, is now a full-time tenure track faculty teaching mineralogy, geochemistry and petrology. This infusion of 'new blood' should help revitalize the program and spur research and recruiting of new majors. Both new faculty have several years of previous teaching experience. Drs. Niemann and El-Shazly have been hired under an agreement which allows a 25 % reduction in teaching load to allow rapid research development and increased potential for publications and grants. They currently have release time as when hired.

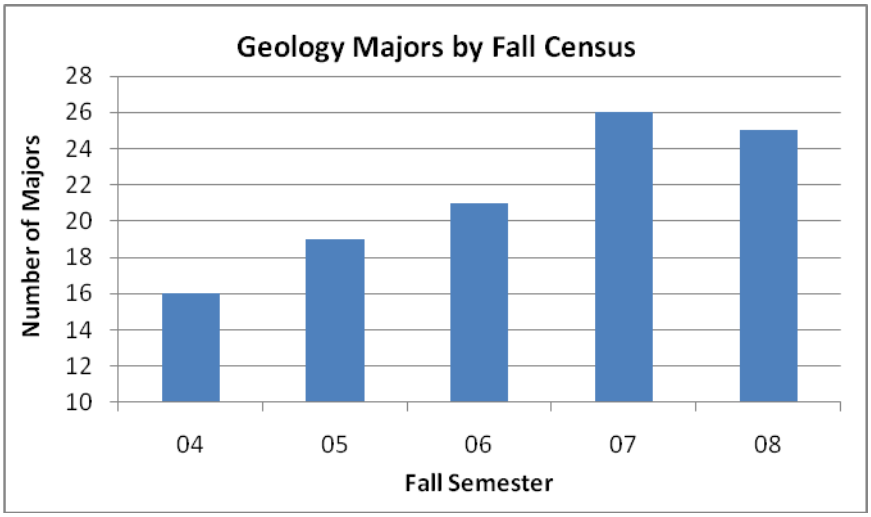
Curriculum Development:

Goals: comprehensive, flexible, relevant coursework that adequately prepares graduates for graduate school or entry level professional positions.

Indicators: success rate of graduates in finding employment or entering grad schools
Employer surveys
Graduate Surveys
Input from External Review Board
Anticipated Employment Trends: U.S. Dept of Labor

In 2007-2008, there were seven geology graduates and of those, six have geologically related jobs. The other graduate is looking for a geological job in Florida but due to the down turn in the economy, he has not been successful to date.

No employer or graduate surveys were conducted for graduates in 07-08 . A 10 year survey covering 98-2007 was completed as part of 5(+) year program review.
It was found that 85 % of graduates entered geologic profession or graduate school.
It is expected that there will be 5 or 6 geology graduates for the 08-09 academic year.
There are currently 25 geology majors identified in the Banner. The graph below tracks the number of geology majors for the fall semester over the past five years.



There has been a constant increase in the number of majors. The figures are the combined BA and BS majors. There has consistently been only three or four BA majors. The slight drop this fall is due to the relatively large number of seven graduate this past year. Most of our majors come from taking one of our introductory classes.

A new area of emphasis was formally approved for the B.S. Geology program during the spring of 2004. This area was developed response to recent changes and predicted trends in the job market and with input from the department's external advisory board. The area of emphasis in environmental geoscience utilizes an interdisciplinary curriculum which will prepare graduates for careers involving the application of geologic concepts to the solution of environmental problems. These problems include 1) the protection of human health and natural ecosystems from adverse biochemical or geochemical reactions to naturally occurring chemicals or to chemicals and chemical compounds released into the environment by human activities, and 2) the protection of life, safety and well-being of humans from geological processes such as floods, earthquakes, and landslides through land-use planning.

The curriculum for the environmental geoscience area of emphasis has been developed in accordance with guidelines published by Environmental Geoscience Division of AAPG, the U.S. Department of Labor Occupational Outlook Handbook (2003-2004 edition) and with input from the Department's external advisory committee:

Name	Company/Agency	Degree(s)	Current Position
Steve Brewster	U.S. Army Corp Engineers	BS GLY, MU ('83)	Chief of Geology
Charles Montgomery	Novel Geo-Environmental	BS GLY, MU ('92)	Project Engineer
Todd Church	URS Corp (Envir,Geotech)	BS Earth Sc, Penn St	Senior Hydrogeologist
Ed Rothman	Columbia Natural Resources	BS, MS WVU	Geologist, Triana Energy
Kent Adkins	Arcadis G & M	BS GLY, MU ('85)	Project Manager
George Jenkins	WV Dept of Envir. Protection	BS GLY, MS ES	Head Geologist DEP/OMR

All have been very supportive of this initiative.

The department's other area of emphasis is engineering geology which has four students selecting that option. It requires more math and requires civil engineering courses. One of our geology graduates in this track decided to continue his education here at Marshall and received a civil engineering B.S. this past May. He now works for an international engineering firm in Kansas City, Missouri. Part of the appeal of this track is that it does not require two years of a foreign language.

West Virginia is one of only a few states that currently does not have a certification for professional geologists. The National Association of State Boards of Geology (ASBOG) is responsible for coordinating and standardizing the examinations that are used certification purposes in those states which do require certification for practicing geologists. Two tests are given: 1) fundamentals of geology and 2) practice of geology. The weighting given to different subject areas varies between tests:

Content Domains for ASBOG Fundamentals of Geology & Practice of Geology Blueprint

Content Domain	Fundamentals	Practice
A. Field Methods & Remote Sensing	29.1 %	35 %
B. Mineralogy, Petrology, Petrography & Geochemistry	13.6%	2.5 %
C. Sedimentology, Stratigraphy, & Paleontology	10.0%	3.8 %
D. Geomorphology	6.4 %	6.3%
E. Structural Geology & Tectonics	9.1 %	2.5 %
F. Geophysics & Seismology	3.6 %	5.0 %
G. Hydrogeology	24.5 %	25 %
H. Engineering Geology	2.7 %	11.3 %
I. Mineral, Petroleum, & Energy Resources	0.9 %	8.8 %

The ACAT exam has the 9 subject areas which receive approximately equal (11% each) weight; R=required course in Marshall's BA/BS Geology Curriculum, E=Elective

Geomorphology	R
Historical Geology	R
Mineralogy	R
Oceanography	E
Paleontology	E
Petrology	E
Physical Geology	R
Stratigraphy	R
Structural Geology	R

All of these subject areas for both ASBOG and ACAT exams are available through the Geology or Physics departments at Marshall. If students wish to be professionally certified, the required courses in the Environmental Geoscience and Engineering Geology Areas of emphasis would best prepare them for professional certification in nearby states. No problems in obtaining certification have been reported by graduates who wished to obtain it. If students wish to excel on the ACAT and be better prepared for grad school,

the B.S. Geology curriculum would be more suitable with Paleontology and Oceanography taken as electives.

The Department plans to add an Engineering Geology Lab Course in 2006. The content in GLY 451 and 457 is being modified by Dr. Niemann to provide more in-depth treatment of soils. These modifications will benefit the environmental and engineering areas of emphasis and will improve preparation for professional certification. An additional change in the geochemistry is in committee. Currently, the geochemistry lab and lecture are combined in a four credit course. It will be split into a separate lab and lecture course. Most geology departments have the split between lecture and lab.

Learning Outcomes for Each Course

Course objectives for each course taught in 2004-2005

GLY 2007/-2008 Assessment - Course Goals

Course	Title	Goals
GLY 110	General Geology	To gain 1) a basic understanding of the internal and external processes that create and shape the surface of the earth. 2) an appreciation for the wide range of time scales at which earth processes operate 3) an awareness of how these processes can affect our everyday life
GLY 150	Oceanography	To gain: 1) A basic understanding of the oceans and atmosphere and their Intimate connections, and how and influence the earth's climate 2) basic knowledge and understanding of the many dynamic features and processes that can be seen at seashores.
GLY 150L	Oceanography Lab	To gain an understanding of 1) oceanographic processes 2) ocean basin physiography
GLY 200	Physical Geology	To gain: 1) Develop a basic understanding of how the earth works; 2) Become familiar with the various types of internal and external geologic processes as well as the earth materials that they create and modify through time; 3) Develop an awareness of the impact of man's activities on certain geologic processes and the importance of understanding these interactions to our own well being; this should enable students to make better-informed decisions regarding a number of scientific, technological, societal, and individuals issues; 4) Acquire an understanding of the interconnectedness of all sciences
GLY 201	Historical Geology	The goals are: 1) To provide an understanding of current geologic interpretations regarding the origin of the earth and its physical, chemical, and biological development through time; 2) To develop an awareness of the principles, assumptions, types of evidence, and methodology used to develop historical interpretations from the rock record; 3) To provide an overview of the changing geography of the world through time, with emphasis on geologic events that have shaped the

		North American continent.
GLY 210L	Earth Materials Lab	1) acquisition of hands-on experience in the description and identification of rocks, minerals and fossils; also to become familiar with the economic uses of various minerals and rocks as well as the value of fossils in understanding the rock record. 2) Acquisition of ability to read topographic maps, recognize landforms, use coordinate systems and map scales, determine slope and construct cross-sectional profiles 3) Development of an understanding of the relationship between geologic processes and the specific earth materials that they create.

Y 211L	Historical Geology Lab	To gain: 1) Hands on experience in identification of fossil specimens, classification systems, stratigraphic correlation, sedimentary facies and paleoenvironments, geologic map interpretation; 2) field experience using road cuts and formations and collecting fossils. Correlating the material learned in class out in the field in identification specimens.
GLY 212	Mapping	Goals:1) To develop a basic understanding and working knowledge of trigonometry as it relates to mapping. 2) To learn operation of the Brunton Compass, theodolite and GPS instruments and the presentation of their data in map form.
GLY 314	Mineralogy	Goals: 1)To provide a foundation for atomic structures, chemistry, physical properties, classifications, and genesis of the minerals which make up rocks. 2)To develop the capacity to identify and characterize any given mineral; be knowledgeable about specialized techniques that may be required for identification; and to be conversant with the importance that this mineral has in our understanding of the Earth.
GLY 423	Sedimentary Petrology	The goals are for each student to: 1) become familiar with basic optical mineralogic principles and optical properties of sedimentary rocks as seen in thin sections using the petrographic microscope. 2) To develop the capacity to distinguish various types or framework grains, cements, matrix and pore space. 3) To integrate textural and mineralogical attributes into a reconstruction of depositional and diagenetic events.
GLY 427	Fossil Fuels	To develop an understanding of: 1) the composition of coal, coal quality parameters, and coal-forming depositional environments 2) coal mining methods, reserve estimates, causes and nature of coal seam discontinuities, roof rock quality and problems 3) cause and remediation of environmental problems associated with surface and deep mining, and with coal utilization 4) the composition of petroleum and natural gas, the nature of precursors and necessary depositional and diagenetic conditions for their preservation and maturation 5) hydrocarbon migration, and various structural, stratigraphic and combination trapping mechanisms 6) primary, secondary and tertiary recovery methods 7) exploration methods including subsurface stratigraphic and structural analysis 8) the basic elements of well logging; determination of rock type and fluid content from borehole data 9) economic factors controlling petroleum development

		10) petroleum and coal geology of West Virginia and vicinity
GLY 451	Geomorphology	The goals of the course are for each student to: 1) Acquire a basic knowledge of landforms; 2) Become familiar with the various internal and external processes that produce landforms; 3) Acquire an understanding of how landforms are modified through time 4) Develop an awareness of man's impact on landforms and how an understanding of this impact can be utilized in making better-informed decisions regarding scientific, technological, societal, political, and individual issues.
GLY 451L	Geomorphology Laboratory	Course objectives: To provide students with an understanding of tools and techniques regarding photogrammetry and air photo and topographic map interpretation.
GLY 455	Hydrogeology	Course objectives: To provide a fundamental understanding of the concepts and principles that govern the occurrence and movement of water on and within the earth and to gain a quantitative working knowledge of surface and groundwater hydrology.
GLY 455L	Hydrogeology Lab	The laboratory will be a series of exercises covering various aspects of the hydrologic cycle and hydrologic properties of earth materials. The exercises are designed to illustrate hydrologic principles and to solve hydrologic problems.
GLY 456	Environmental Geology	The goals of this course are for each student to: 1) acquire a basic knowledge of the fundamental principles of environmental geology; 2) become familiar with the various internal and external processes that impact the environment; 3) acquire an understanding of human interactions with the environment; 4) acquire an understanding of mineral and energy resources and how their availability and use impacts the environment. 5) Develop a basic knowledge of how earth system science can be utilized in making better informed decisions regarding scientific, technological, societal, political, and individual environmental issues.
GLY 456L	Environmental Geology Lab	The goals of this course are for each student to: 1) acquire a basic knowledge of the techniques used to investigate or evaluate environmental problems related to geology and geological processes; 2) acquire an understanding of human interactions with the environment; 3) acquire an understanding of mineral and energy resources and how their availability and use impacts the environment. 4) Develop a basic knowledge of how earth system science can be utilized in making better informed decisions regarding scientific, technological, societal, political, and individual environmental issues.
GLY487	Independent Study	A project that allows students conduct in-depth research that utilizes the geologic literature, data collection and analysis, and culminates in a written technical report. Goal is to allow for the pursuit of a research topic that is beyond the scope of an individual course, and simulate problem solving that prepares students for graduate work or entry level professional tasks.
GLY 491-492	Capstone	An independent study or internship research project designed to apply of a wide range of geologic skills to the solution of a geologic problem, culminating in the preparation of an oral and written report.

III. Measuring Instruments

A. Programmatic Instruments

Program Assessment Worksheet
Measuring Instruments

Department: ___Geology

Degree: AAS:_____;Certificate:_____;BA:__X__;BS:__X__;MA:_____;MS:_____;
Specialist:_____; EdD:_____; PhD:_____

Program:___Geology_____ CIP CODE:_SG10, SG20_____

Date Completed:_____12/2/2008_____

*Code: F=Formative Assessments; S=Summative Assessments; VA+Value Added Assessments

Assessment Measures: Local Major Codes in Program:

X= summative assessment	B.A.	B.S.	B.S Area Emphasis Engineering Geology	B.S. Area Emphasis Evironmental Geoscience
***Internal Measures				
1. Written Examinations	X	X	X	X
2. Quizzes	X	X	X	X
3. Term Papers	X	X	X	X
4. Oral Presentations	X	X	X	X
5. Oral Examinations				
6. Discussion Groups				
7. Focus Groups				
8. Pre/Post Tests (GLY 110,150,200)	X	X	X	X
9. Portfolio Assessment				
10. Simulation Studies		X	X	X
11. Standardized Tests				
12. Observation				

13. Departmental Tests				
14. Thesis/Dissertation				
15. Comprehensive Examinations	*	*	*	*
16. Faculty Evaluations				
Course evaluations 17 Student Satisfaction Surveys	X	X	X	X
18. Juries				
19. Scientific and Tech Writing Cs			X	X
**External Measures:				
1. Graduate Surveys (5 yr)	X	X	X	X
2. Nationally Normed Exam (ACAT)(**out for 07-08**)	X	X	X	X
3. Employer Surveys (5 yr)	X	X	X	X
4. Field Camp @ outside schools		X		
5. Accrediting Organization	None available			
6. External Advisory Board		*	*	X

* under consideration

B. Course Related Instruments
- Exams
- Term (Research) Papers
- Oral Presentations
- Lab Exercises
- Lab and field Projects/Reports

C.. Compliance with BOT Initiative 3:

"Each academic program must identify and use a quantitatively based means of assessing the knowledge and skills of its graduates against a national standard. Where comparative data are available, the benchmark shall be the national standard and the goal shall be to meet or exceed the national standard. The intent is to measure the skills of a random sample of graduates as a means of assessing the quality of the academic program. The results of the assessment will be included in program review self-study reports and incorporated into the annual program review format beginning with the 1997-1998 academic year. Campuses will report to the Board of Trustees on the assessment tools to be used for each program by {June 30, 1997}. For those programs were comparative data are not available to establish a benchmark, the campus must establish a benchmark and explain the rationale"

IV. Plans for the Current Year

- Formalize capstone policy
- more extensive use of PowerPoint in classes to facilitate instruction
- reduce course size limit for intro courses from 80 to 60 and more widely use field trips; this may increase teaching effectiveness/enrichment and help in recruiting new majors
- promote new area of emphasis in Environmental Geoscience
- strengthen and increase ties with engineering, environmental and energy companies/agencies; vigorously pursue internship opportunities for juniors and seniors
- continue use of existing approaches/tools for assessing student outcomes
- consider developing comprehensive exam for seniors to gauge trends in performance within the department over time
- continue course-embedded testing at 100-200 level
- continue to upgrade/update courses
- encourage/promote Geology summer field camp with aid of full scholarship
- modify graduate surveys to include information about professional certification
- include request for certification information from graduates in future surveys
- clarify and standardize capstone policy, procedures, and methods for evaluation
- introduce a new summer field course supported by Hedrick grant and Fox Summer Field Camp Scholarship.

V. Most Important Thing Learned (by myself)

- The assessment process and requirements are tedious to follow.
- The time it takes to prepare a comprehensive assessment is considerable; it takes time away from teaching and working with students; this is counterproductive. Once a format has established, the assessment does take somewhat less time to complete.
- The assessment process does make faculty (at least myself) more conscious of our purpose and objectives, and what it takes to be accountable.

APPENDIX A - Requirements for the Environmental Geoscience area of emphasis:

I. English Composition/Communication	Hours
ENG 101	3

	ENG 102	3
	ENG 354 Scientific & Technical Writing	3
	CMM 103 (or 305, or proficiency)	0-3
II.	Mathematics	
	MTH 132 Pre-calculus with Science Applications	5
	MTH 229 (Calculus I), MTH 225 (Statistics)	8
III.	Social Sciences	
	GEO 320 Environmental Geography	3
	GEO 429 Fundamentals of GIS	3
	ECN 200 or 250 Survey of Economics or Microeconomics	3
	(+ 3 additional social science courses)	9
IV	Literature	3
V	Classics/Philosophy/Religious Studies	3
VI.	Natural Sciences	
	IST 322 Assessment I: Terrestrial Systems	4
	IST 323 Assessment II: Aquatic Systems	4
	CHM 211,212,217, 218 Principles of Chemistry	10
	CHM 327 Intro to Organic Chemistry	5
	PHY 201-204 General Physics	8
	PS 410 Remote Sensing	4
	GLY 200, 210L Physical Geology, Earth Materials Lab	4
	201, 211L Historical Geology	4
	212 Field Mapping	2
	313 Structural Geology	4
	314 Mineralogy	4
	325 Stratigraphy and Sedimentation	4
	421 or 423 Petrology or Sedimentary Petrography	4
	430 Computer Methods	4
	451, 451L Geomorphology	4
	455, 455L Hydrogeology	4
	456, 456L Environmental Geology	4
	457 Engineering Geology	3
	425 Geochemistry	4
	GLY 491 or 492 (Capstone)	2

		132-135 hrs

Schools administering the ACAT exam in geology

California State University – San Bernadino
Eastern Kentucky University

Oklahoma State University
Saint Mary's University
Southwest Missouri State University
Tennessee Technical University
The University of Toledo
University of Arkansas – Little Rock
University of North Alabama
University of Southern Indiana
University of Tennessee - Chattanooga
University of Tennessee -Martin
Western Kentucky University

Schools to be contacted for their geology program assessments

State	School	Faculty	Chair	Phone
Kemtucky	Morehead State	5	Charles Whidden	606/783-2914
Ohio	Youngstown State	6	Ikram Khawaja	330/742-3612
Ohio	Univ. of Dayton	5	Michael Sandy	937/229-3432
Ohio	Dennison Univ.	5	Kennard Bork	740/587-6217
Ohio	Marietta College	2+2	Fred Voner	614/376-4847
Ohio	Oberlin College	6	Bruce Simonson	440/775-8350
Ohio	Ohio Weslyan	7	Karen Fryer	740/368-3999
Ohio	Whittenbery Univ	5	Robert Morris	937/327-7335
Ohio	College of Wooster	4	Lori Bettison-Varga	330/263-2380
Pennsylvania	Juniata College	4	Lawrence Mutti	814/641-3601
Pennsylvania	Lafayette College	4	Don Germanoski	610/350-5193
Pennsylvania	Slippery Rock Univ.	6	Michael Stapleton	724/738-2049
Pennsylvania	Susquehanna Univ.	4	Richard Lowright	717/372-4215
Pennsylvania	Temple Univ.	6	George Meyer	215/204-7172
Tennessee	Univ. of the South	5	Martin Knoll	931/598-1713
Tennessee	UT-Martin	5		901/587-7430
Virginia	Washington and Lee	5	Frederic Schwab	540/483-8800
West Virginia	WV Univ.	12	Trevor Harris	304/293-5603
West Virginia	Concord	1+3	Joseph Allen	304/384-5327

Telephone survey questionnaire for geology program assessment

Assessment Survey
Date _____
School _____ Respondent
_____

Does your geology department have a program assessment?
How often is it done?
Is it mandated by administration?
How long have you been doing assessment?
Has it gone through an evolution?
What assessment tools (instruments) have you abandoned, if any?

What assessment tools (instruments) do you now use?
For majors:

For non-majors: