

Evaluation and Assessment of Physical Geology Lecture (GEOL 1303)
Department of Geosciences, Texas Tech University
Academic Year: Fall 2007
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General Course Information

Expected Learning Outcomes:

1. Explain the scientific theories on Earth Formation.
2. Identify, describe, and understand the formation of common earth materials (ex: minerals, igneous rocks, sedimentary rocks, and metamorphic rocks).
3. Understand the processes that shape our landscape (ex: erosion, deposition, stream systems, glacial systems, arid systems, coastal systems).
4. Relate their knowledge of earth materials to the active processes shaping our dynamic planet.
5. Discuss the theory of plate tectonics and its relationship to earth processes and earth history.
6. Use their knowledge of earth materials and processes to show how the rock record can be used to interpret geological events in the past.
7. Understand earth resources and current resource management issues.

I have informally added an ELO that focuses on the scientific method, how it applies to geology (classical vs. historical sciences), its base in observation, and the interpretation of scientific data.

Assessment of Expected Learning Outcomes:

ELO coded exam questions (Students receive this as graded exams) (GRADED)

Assignments (GRADED)

Anonymous Discussion Forum for Q&A (UNGRADED)

Online Chat Review Sessions (UNGRADED)

Pre and Post Testing (UNGRADED)

In-house Evaluation of Course and Instructor (UNGRADED)

University Evaluation of Course and Instructor (UNGRADED)

Student Grading Scheme

Exams (75%) – 4 mandatory exams, 1 optional replacement exam

Assignments (15%) – 5 mandatory assignments (2 were pre and post tests for a completion grade only)

Attendance (10%) – 4 exam terms, 1 free absence per term

Basic Course Demographics

- Introductory course in the geological sciences
- Students ranging from freshmen to seniors, predominantly freshmen
 - Freshmen – 107 (61%)
 - Sophomores – 43 (24%)
 - Juniors – 17 (10%)
 - Seniors – 9 (5%)
- Number of students per major:

Advertising – 2	Agriculture – 3	Anthropology - 1	Architecture – 5	AS Undeclared – 26
BS Undeclared - 3	Civil Engineer – 1	COBA - 53	Communications – 4	Computer Science – 1
Early Childhood – 3	Economics – 1	Electronic Media – 1	Engin. Undeclared – 6	English – 2
Environ. Engin. – 1	Exercise/Sports – 1	Fam. & Cons. Sci. – 1	Geosciences – 3	History – 1
Human Devel. – 3	Interior Design – 1	Journalism - 2	Mass Comm. – 2	Engineering – 1
Mathematics – 2	Mech. Engin. – 1	Mult. Science – 7	Music Performance – 1	Music – 3
Pers. Finance – 2	Petro. Engin. – 14	Political Science – 1	Pre-Law – 2	Pre-Medicine – 2
Pre-Phys. Ther. – 1	Psychology – 7	Public Relations – 4	Sociology – 1	

- Class size of 176 students (following withdrawals and drops)

Instructor Initiated Modifications to Course

Past (Fall 2006, Spring 2007) Problems Observed (Instructor):

- Students unaware of the mixed majors, science, non-science nature of the course (Instructor).
- Students not attending class (Instructor).
- Students did not attend last classes, or take notes when final exam was optional for grade replacement (Instructor).
- Students not participating in ungraded Pre and Post Testing or in-house course evaluations (Instructor).
- Time constraints prevented teaching some material (Instructor).

Current Problems Observed (Instructor & Student):

- Tests too difficult/detail oriented/questions confusing (Student).
- Attendance policy too stringent (Student).
- Some lectures need further revision and updating (Instructor).
- Students simply would not ask questions if they were not directly asked to ask questions (in class or on WebCT) (Instructor).

Changes Instituted for the Fall 2007 Semester:

- Exam Schedule – Changed from 3 mandatory, 1 optional final to 4 mandatory (including final) and an optional replacement exam for missed exams or grade replacements.
- Attendance Policy was maintained despite some complaints from students in an effort to keep the students engaged and attending classes.
- Assignments replaced more interesting case studies. Increased the number of topics covered by placing responsibility for several topics entirely in the students' hands.
- Experimented with fostering a deeper understanding of science and the scientific method.
- Asked more questions tying topics together and asking for application of knowledge.
- Discontinued in class exam debriefings, replaced with a written debriefing including the 10 most missed questions in WebCT. Students were informed that two out of the top 10 questions would be asked again on the following exam.

Future Changes that may be Beneficial:

- Further modification of lectures.
- At least one additional assignment. Increase assignments from 20 to 30 automatically graded multiple choice questions. → For increased coverage of material.
- Keep attendance policy even though it is reviled by some of the students.
- Addition of demonstrations/videos to break up the monotony of constant PowerPoint lectures.
- Revise arrangement of lectures in course, a few seemed out of step with the flow of the course.

Recommended Changes to Physical Geology at Texas Tech:

- A geology/science version of the course would allow for better preparation of majors.
- A non-science version of the course could be used as a recruiting tool and to better aim the material at students taken to course to fulfill the core curriculum requirement in science/lab science.
- Tie the lecture and the lab together. Lab grades would buffer grades on more thought provoking and challenging lecture exams. Uniformity in schedule between lecture and lab would encourage repetition and digestion of material. Students need to have a hands-on component with the lecture. Students taking the lecture course without the lab course are at a distinct disadvantage.

General Course Assessment Fall 2007

Student Attendance

- In general the correlation of class success and class attendance is well accepted, especially for introductory lecture based courses.
- Figures 1a and 1b show attendance for the fall semester, and the relationship between student attendance and student grade for the course.

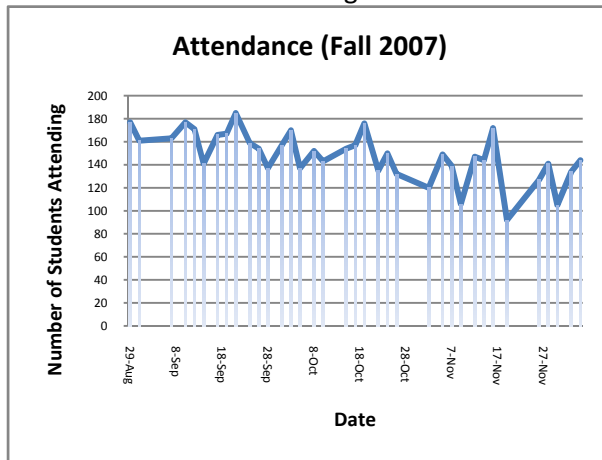


Figure 1a: Attendance for the Fall Semester of 2007.

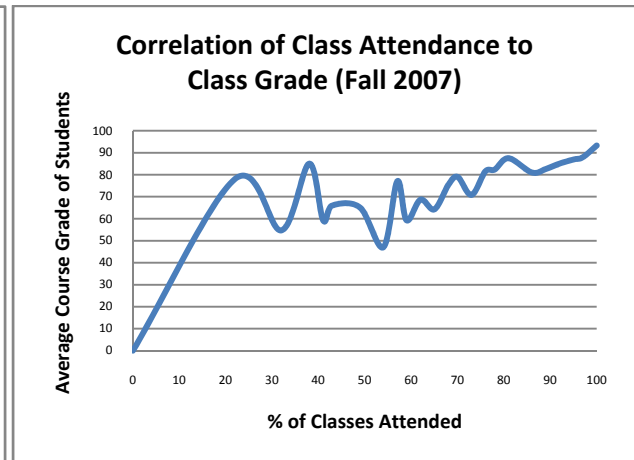


Figure 1b: The Correlation between Attendance & Class Grade.

- As expected there was a general decrease in attendance throughout the semester. The day before weekends or holidays would have the lowest attendance of the week. The day before exams and the date of exams, along with the start of the school week saw the highest attendances.
- Most students in the class attended at least 60% of the time or more.
- Figure 1b shows a strong correlation between course grade and the amount of class attended. Below 60% this data gets very erratic as a result of the smaller datasets.
- One student never attended class, and never took an exam, or completed an assignment.

Student Self-Reported Use of the Textbook

- To examine the effectiveness and overall use of the textbook students were asked a simple response to how much of the textbook they have read (choices: All, Some, None) (Figure 2a).

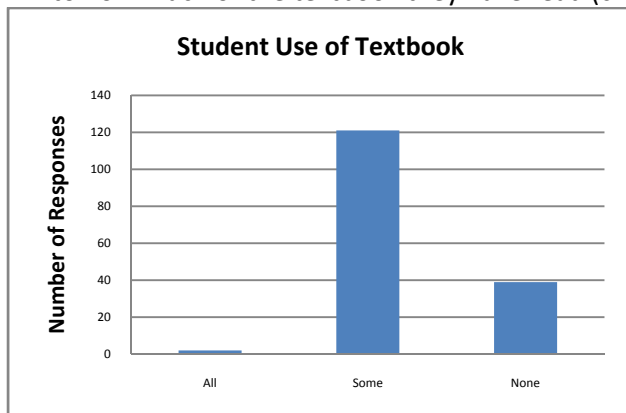


Figure 2a: Textbook Use (Fall 2007).

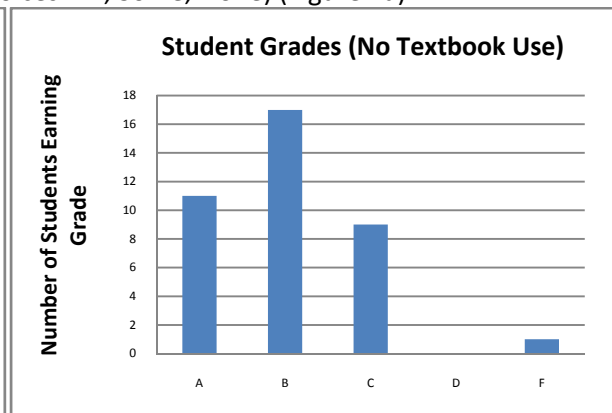


Figure 2b: Grades of Students that did not use the text.

- A large number of students did not read the text. Of those, most did very well (Figure 2b).
- This data is self reported and may not be reliable. If it is, the value of a textbook appears limited.

Student Grades in Course

- Overall, the grade distribution for the semester is very good.
- For the first time, no curve was given for the course. Balancing of the workload, stressing the importance of attendance to students, and detailed review sessions and materials appear to have greatly benefited the students.
- In general the students themselves appeared more willing to work than the students in the previous spring semester.
- About mid-semester several students stopped attending classes, completing assignments, or taking exams. They did not drop the course, causing a slight uptick in the number of F's given this semester.

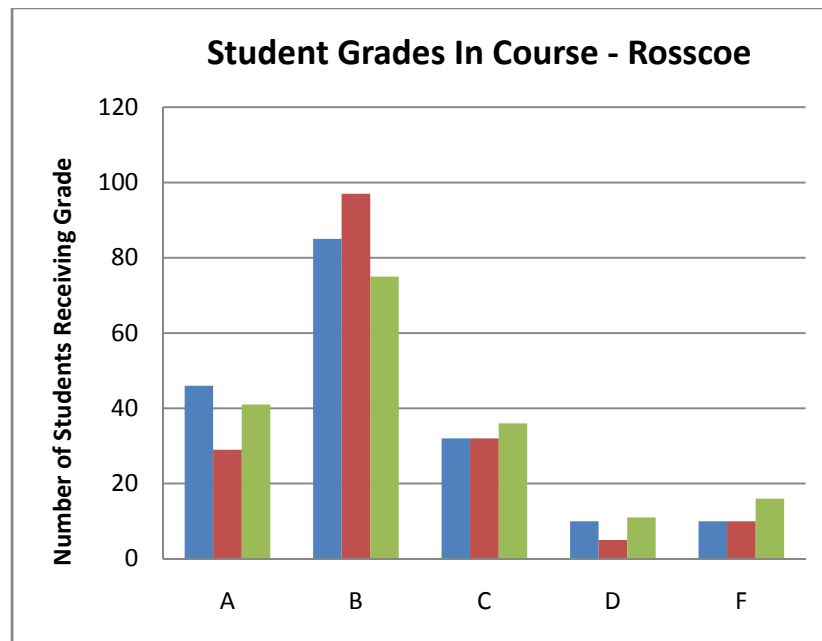


Figure 3: Student grades for the Physical Geology lecture taught by S. Rosscoe at Texas Tech University. From left to right the columns are arranged Fall 2006, Spring 2007, and Fall 2007.

Results of Pre and Post Testing

- Simple free response and multiple choice questions were asked in regards to the expected learning outcomes for the course. Those responses were evaluated for 25% of the class. While some questions were auto-graded, the free responses were varied and required attention to grading. As with previous semesters this 25% sample is not based on grades or sex, simply the first 25% of students as they appear alphabetically.
- ELO 1 – Students did 38.5% better on the post examination.
- ELO 2 – Students did 39.6% better on the post examination.
- ELO 3/4 – Students did 30.6% better on the post examination.
- ELO 5 – Students did 55.8% better on the post examination.
- ELO 6 – Students did 30.9% better on the post examination.
- ELO 7 – Students did 211.43% better on the post examination.
- Overall students this semester did 51.2% better on the post examination than the pre-exam.

Assessment of ELO Progress For the Course

- Evaluation of the Pre and Post Examinations leads to the conclusion that students did very well in reaching their ELO goals, with 50+% overall improvement. The results of this semester versus Fall 2006 (the only previous semester with a post exam) can be seen in Figure 4.
- In addition, questions on all of the exams this semester were keyed to specific ELO's. The average % correct for each ELO question set as compared to the previous semester can be seen in Figure 5.

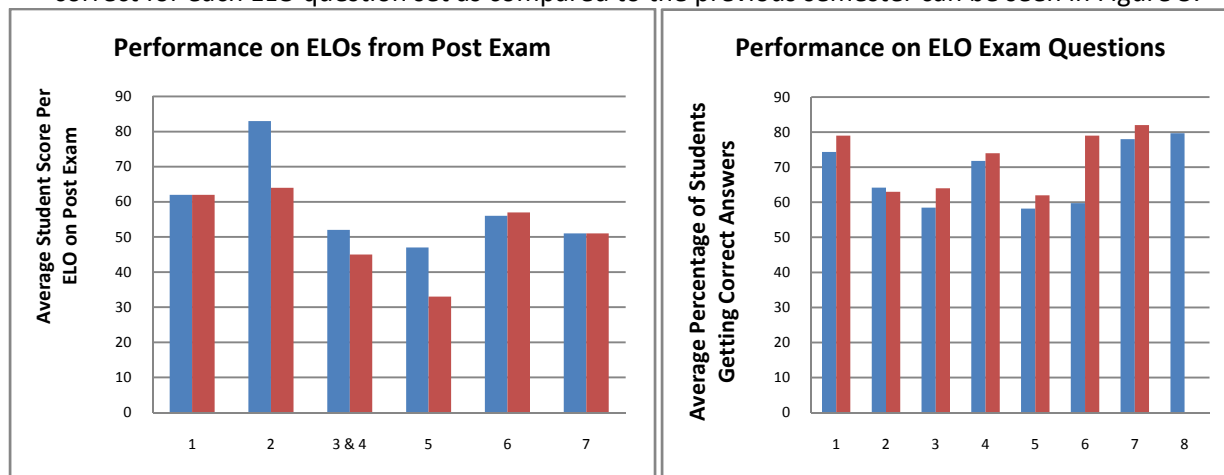


Figure 4: Student performance on ELOs from the Post Exam. Fall 2007 data (left) compared to Fall 2006 data (right).

Figure 5: Student performance on ELO keyed questions from exams. Fall 2007 data (left) versus Spring 2007 (right).

- Comparison of the data from Fall 2007 to approximately equal data in either Fall 2006 or Spring 2007 comes with mixed results.
- A proper post exam was given in the Fall of 2006 and the Fall of 2007, no post exam was given in the Spring of 2007 (optional assignment at the end of the semester, with no participation from students). Comparison of the data shows that ELO success was approximately the same in the cases of ELO 1, ELO6, and ELO 7. Noticeable improvements can be seen in ELO 2, ELO 3/4, and ELO 5. The post exams would not be considered of equal challenge or length so the best we can take from this data is that the course has remained somewhat successful in having students reach the ELO goals.
- Spring of 2007 and Fall of 2007 are the only semesters in which exam questions were keyed to ELO standards for analysis. In general when compared to the data from Spring 2007 there a decline in student ELO success for the Fall of 2007. A major contributor to this differential may simply be the sample size. There were 4 exams in Spring 2007, 5 exams in Fall 2007. 3 more questions were asked for ELO 1, 36 more questions for ELO2, 20 less questions for ELO 3, 62 more questions for ELO 4, 18 less questions for ELO 5, 8 more questions for ELO 6, 8 more questions for ELO 7, and the addition of questions for ELO 8 (scientific method) in the Spring of 2007. These wide variations in sample set size may be the reason for many of the differences seen between the data of Spring 2007 and Fall 2007.
- If the data is used as a range for Fall 2007, then: ELO 1 success is between 62 & 74%, ELO 2 success is between 63 & 82%, ELO 3 success is between 52 & 58%, ELO 4 success is between 52 and 72%, ELO 5 success is between 46 & 58%, ELO 6 success is between 56 & 58%, ELO 7 success is between 51 & 77%, and ELO 8 is successful at approximately 79%.

Summary

- Student attendance is closely correlated with class grade in the course, the use of attendance as a portion of the grade remains integral to student success.
- The textbook is rarely read in total, and may be of little value in an introductory survey course.
- Student grades indicate successful completion of the course. Even more so in that un-curved course grades for Fall 2007 are on target with the curved course grades of Fall 2006.
- Pre and Post tests (correlated student by student) indicate an overall increase in ELO success of approximately 51%.
- Students successfully (60% success or higher) mastered ELOs 1, 2, and new ELO 8.
- Students moderately succeeded (low below 60%, high above 60%) in ELOs 4, 5, 7.
- Student improvement is needed (high below 60%) in ELOs 3 and 6.
- ELO 3 (Surface and Land-forming Processes) coverage was reduced this semester and primarily focused on in homework assignments that were simple multiple choice responses. This likely accounts for the decline in success of this ELO. Bringing more of this topic back to the classroom will be beneficial for the students.
- ELO 6 (Plate Tectonics) is a complex system of interactions. Students score very high on the guts of the system, but its interactions with the climate system, and connection to the rock cycle and rock materials seem to be difficult for the students to grasp. In general students seem to lack the ability to draw connections between the material and focus only on vocabulary and easily memorized topic.

Student Evaluations of Course and Instructor Fall 2007

WebCT Survey (In House)

In WebCT, a simple three question free response survey was given. The following results are the compilation of the 160 respondents to this survey. *Note:* Completion of the survey was tied to completion of the post exam, which students were given a completion grade of 100 for.

Question 1: Did you think this class was a valuable learning experience?

- 146 students responded positively to this question. Of these responses approximately 40 mentioned that the course was valuable but would serve them no future benefit in their major.
- 9 students said that the course was sort of valuable but again so no benefit to their major or career.
- 5 students said no, with little elaboration.

Question 2: What did you most enjoy about this class?

- The results are summarized below.

Instructor (46)	Doom Week (40)	Lectures (36)	Formation Theory – Universe, etc. (10)	Posting Lecture (5)
Everything (4)	Review Chats (3)	Review Sheets (3)	Rocks (3)	Processes (3)
Labs (2)	Time of Day (2)	Tests (2)	Scope (2)	Energy (2)
Disaster Alerts (1)	Systems (1)	Tectonics (1)	Structure (1)	WebCT Assignments (1)

Table 1: Students most enjoyable components/topics in the course.

- In general students were very pleased with the lectures and the lecturer, focusing mostly on the entertainment or humor value added by the instructor.
- As topics go, Doom and Gloom week ranks in again as a favorite. I had toyed with dropping the week and incorporating it into other topics, but student response in previous semesters was too favorable to do away with it.
- Two students liked the labs (even though they are separate from the course).
- “Good professors teach the material, great ones make it relative to our lives.” – Student comment

Question 3: What did you least enjoy about this class?

- The results are summarized below.

Rocks/Mins (45)	Tests (34)	Assignments (13)	Nothing (11)	Boring (10)	Scope (8)
Labs (6)	Attendance (6)	Class Size (5)	Memorization (3)	Too Many Notes (3)	
Loud Students (2)	Time of Day (2)	Personal (1)	Instructor (1)	Streams (1)	Everything (1)
Tectonics (1)	Landforms (1)	Lecture (1)	AC Noise (1)	Not Enough Grades (1)	
Deformation (1)	College Course Requirements (1)		Felt like review of 8 th Grade Science (1)	More on Oil (1)	

Table 2: Students’ least enjoyable components/topics in the course.

- Tradition continues and students despise rocks and minerals. Approximately half did continue on to say how they understood rocks and minerals were the foundation of all geology.
- Tests were hated, Attendance requirement disliked, and Assignments were hated. Basically anything that counted for a grade seemed to be on the list.
- Several students thought the class was boring, too memorization based, and that you shouldn’t have to take so many notes in a college course.
- Surprisingly this semester the students were very critical of some University issues. Class size, the loud AC, and the fact that the college requires them to take science were all concerns.
- I concur; class size is far too large.
- “The least favorite thing about this course, for me, was my own work ethic.” - Student

University Evaluations – Short Response

Question	Fall 2006 Average (n=97)	Spring 2007 Average (n=59)	Change (F→S)	Fall 2007 Average (n=113)	Change (S→F)	Trend (Total)
Overall this instructor was effective.	4.43	4.49	+0.06	4.54	+0.06	+
The instructor was available for consultation during office hours or by appointment.	4.61	4.27	-.34	4.52	+0.25	+/-
The instructor stimulated student learning.	4.42	4.41	-.01	4.54	+0.13	+
The instructor treated all students fairly.	4.68	4.58	-.10	4.64	+0.06	+/-
The instructor treated all students with respect.	4.80	4.54	-.26	4.68	+0.14	+/-
The instructor welcomed and encouraged questions and comments.	4.71	4.37	-.34	4.55	+0.18	+/-
The instructor presented information clearly.	4.42	4.39	-.03	4.52	+0.13	+
The instructor emphasized major points and concepts.	4.42	4.52	+0.10	4.57	+0.05	+
The instructor went beyond presenting information from the text.	4.64	4.41	-.23	4.58	+0.17	+/-
The instructor demonstrated knowledge of the subject.	4.86	4.72	-.14	4.79	+0.05	+/-
Overall this course was a valuable learning experience.	4.22	4.08	-.14	4.3	+0.22	+/-
The assignments were relevant and useful.	4.37	4.12	-.25	4.25	+0.13	+/-
Course materials were relevant and useful.	4.40	4.05	-.35	4.27	+0.22	+/-
Expectations were clearly stated either verbally or in the syllabus.	4.54	4.37	-.17	4.5	+0.13	+/-
The testing and evaluation procedures were fair.	4.13	4.29	+0.16	4.35	+0.06	+
The workload was appropriate for the hours of credit.	4.05	4.26	+0.21	4.45	+0.19	+

Table 3: Summary of average student responses to University evaluation for each semester teaching Physical Geology Lecture (current semester highlighted).

- All student evaluations have gone up from the Spring 2007 semester.
- Instructor effectiveness, stimulation of learning, clear presentation, emphasis on key concepts, fairness in testing, and appropriate workload have been going up since Fall 2006 and have reached all time highs in Fall 2007.
- All other categories increased from Spring 2007, but have not yet returned to Fall 2006 levels. Most differ only by 1/10 of a point from the Fall 2006 data.
- Of the three other sections of Physical Geology Lecture in Fall 2007, this instructor received the high overall effectiveness rating.

University Evaluations – Student Comments

- 30 comments were positive in nature.
 - “Made sure that we had the opportunity to succeed in his class; overall great class!”
 - “Great teaching style. Funny guy. Made class interesting and fun in an educational way.”
- Most positive remarks went to:
 - Instructor
 - Posting notes
 - WebCT
 - Concise presentation.
- 7 comments were negative in nature.
 - “Attendance policy was too stringent. Students should have to take responsibility for learning info if they don’t come.”
 - “Chill; we are not geology Majors.”
- Most negative remarks went to:
 - Tests
 - Attendance
 - Boring Slides
 - Not Majors

Summary

- In general students remain very pleased with the course and the instructor.
- Each semester there is the complaint like, “Chill; we are not geology Majors.” The sad fact is that there are geology majors in the class that must be prepared for their future course work. This is an organizational issue within the department and university. There needs to be a Majors/Science version of the course, and a Non-Majors/Non-Science version of the course.
- Students are now recognizing class size as an issue, despite the financial benefit to both the department and university a class of 190 is going to result in higher failure rates, if the goal is to educate our students we need to rectify this situation.
- There is an unpleasant background noise in room 007 that should probably be looked at.
- In the future I will try to build in exercises or in class activities to draw connections between individual topics rather than simple bracketed understanding of topics.
- Students have a disadvantage when they come into a course thinking “this will never be of use,” it may be beneficial for the students if a freshman seminar or induction week discussion on the value of a well rounded education and the importance of student feelings toward a course and their success in it.