



Research Project in Hydrogeology

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ACTIVITY

The GL 199 Hydrogeology course covers the basic principles of groundwater flow, including its development, and protection as a natural resource, and the assessment and remediation of groundwater contamination. Students in the course are assigned a choice between working on a project, paper, or a technical brief as a key component of the course. It is a semester long project and accounts for 20% of their course grade. It involves research, writing, and presentation as integral aspects, with analysis, computational modeling and physical (scale or not to scale) model building as optional aspects.

In the two years this course has been offered, this work has been assigned as a team activity in the first year, to encourage conversation and collaboration between the various majors that take this course (Geology, Environmental Science, and Civil and Environmental Engineers), and as an individual effort in the second year.

This poster provides all the key pieces involving this activity, including the formats developed in the two years (including pedagogy), sample projects, assessments and student feedback.

BACKGROUND

This activity is used in the GL 199 Hydrogeology course, which is offered through the Department of Geology and Environmental Sciences at Norwich University. This is an experimental course that has not made it to the course catalogue as yet. It is currently offered to students majoring in Geology, with an acknowledgement that a course in hydrogeology is a desirable component of a Geology curriculum. Environmental Science students are encouraged to take it to deepen their understanding of subsurface processes. This course is considered a science elective for Civil and Environmental Engineering majors, and greatly complements the Hydrology, and Soils and Materials classes that are a part of the regular CE&E curriculum. Students from freshmen through seniors across these three majors are accepted into the course.

With a cross section of majors and academic years in the class, it was determined that a project that has students thinking about a topic of their choice and developing fundamental research and collaboration skills is critical to meeting common workplace demands.

OBJECTIVE

The activity was designed to meet the following objectives:

1. Encourage collaborative research and project work across majors and years.
2. Provide an avenue for asking thoughtful research questions.
3. Seeking answers through literary research, data collection, analysis, computational, numerical and physical modeling.
4. Sharing research findings through presentations to the class.

METHODS

2012 Activity Format: Students worked in groups of 3 to research topics of current interest and make recommendations based on their research findings. The projects spanned from impacts of Tropical Storm Irene on the local hydrogeological conditions around campus, to determining the links between climate change and local hydrogeological changes to developing a physical model of a geothermal heat pump.

The following instructions were provided to students (summarized from actual):

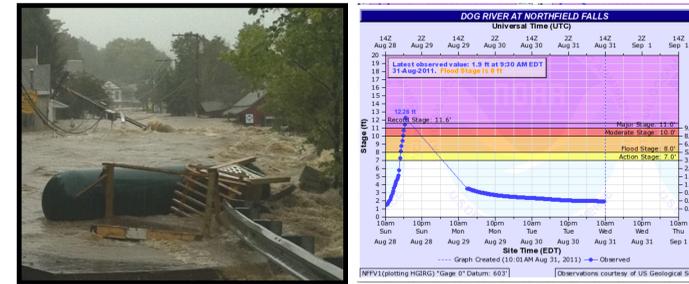
1. Topic Choice and Approval Meeting:

- Worth: 10 points
- Due Date: February 8, 2012
- Details:
 - You will email me your choice of topic and indicate whether you will write a research paper, develop a case study or work on a technology review
 - You must email me this information at tkulkarn@norwich.edu by 4:00 pm of the due date. The subject of the email must be LASTNAME_GL199_PaperTopic
 - Late submissions will not receive any points
 - You will also sign up for a meeting on the appointment sheet posted on my door to discuss your topic with me and receive approval.
 - The 10 points will be awarded only if both parts of this process are followed.

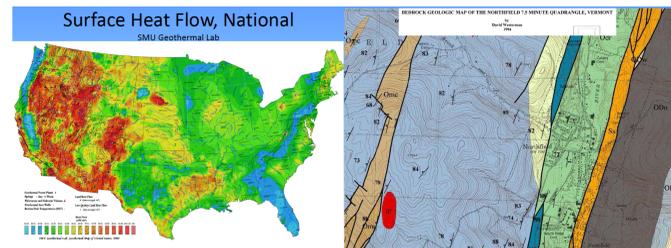
2. Topic Outline and Summary of 3 references:

- Worth: 30 points
- Due Date: February 17, 2012
- Details:
 - You will email me a detailed outline with section and sub-section headings based on your research so far.
 - You will also include in the same submission, the citations for three peer reviewed journal articles that you will use in your research. These may be obtained from the Kreitzburg Library databases or other sources. If you find relevant articles in abstract form, but do not have access to the complete paper, let me know early enough, so I may help you locate the article.
 - Each of the three references must be summarized in a paragraph for this submission.
 - The final submission of the outline and three citations and summaries must be in one document titled "LASTNAME_GL199_Outline_Ref.docx"
 - The MS Word file must be submitted to tkulkarn@norwich.edu by 4:00 pm on the due date.
 - No points will be awarded for late submissions.

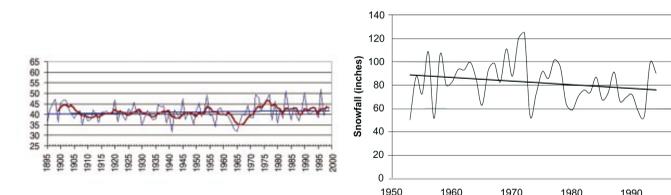
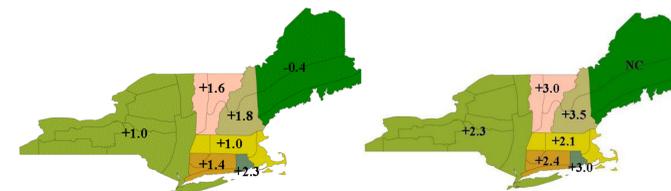
SAMPLE STUENT PROJECTS



FUEL OIL AND PROPANE TANKS IN THE DOG RIVER AFTER TROPICAL STORM IRENE



GEOTHERMAL HEATING RESEARCH (ABOVE) AND MODEL (BELOW)



NEW ENGLAND CLIMATE CHANGE PATTERNS, TEMPERATURE, PRECIPITATION AND SNOWFALL

ASSESSMENT

GL 199 Hydrogeology Team Presentation - Peer Evaluation

Please rate the presentation using the criteria: 5=excellent, 4=very good, 3=average, 2=fair, 1=poor

Topic: Propane and Oil from Irene

1. How much did you learn from the presentation (technical content)?	5	4	3	2	1
2. Organization of presentation (easy to follow?)	5	4	3	2	1
3. Effectiveness/ quality of presentation material (model, slides, handouts, etc.)	5	4	3	2	1
4. Effectiveness of the presentation (clarity, explanations, delivery, interesting, etc.)	5	4	3	2	1
5. Additional Comments					

In addition to instructor evaluation, students performed a peer evaluation of the entire class as well as team member evaluations.

GL 199 Hydrogeology: Project Team Member Evaluation

Team Member's Name	
Rate team member's contribution to the following components of this project:	
1=Did not contribute, 2=Some contributions, 3=Equal Share, 4=Lots of detailed, relevant info	
Providing relevant research and info	
Developing the model/PowerPoint	
Preparing the presentation	
Rate other team members' ability to work effectively in a team:	
1= Unsatisfactory, 2=Marginal, 3=Satisfactory, 4=Exemplary (beyond expectations)	
Fulfills duties on time	
Give and receive constructive feedback with team	
Team member's name: _____	
Was he/she reluctant to meet or put in a fair share of the effort, or showed exceptional leadership or initiative. Please comment.	

CONCLUSIONS

- The projects were perceived by students as a lot of work, but an effort that helped them understand the real life implications of studying Hydrogeology.
- Working in teams was challenging for some groups of students, but it was emphasized that such teams mirror real life professional work teams and finding a way to work with one another was important.
- Students developed critical research skills and worked on developing presentations that incorporated all their research findings, laid out in an interesting manner and presented based on the NSF's triangle approach.
- Overall, the activity was successful and well received and will be repeated in future offerings of this course.