Eco-Literacy and Local Connection
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Physical Geology (GEL 150)

Water Flow Net Model

Introduction and Problem Recognition:

Geology is involved in different aspects of environment, including ancient environment. The concept "the present is key to the past" is the best illustration of this involvement. This relationship is seen clearly in different fields of geology like natural resources (minerals, rocks, energy, water and soil), natural hazards (earthquakes, landslides, volcanic eruptions, floods and desertification) and pollution. Understanding this relationship and at same time appreciating the role of geology will enhance land management, land use and plan and decision-making. Geology is about how our planet works and after all, this is the output and outcome of human knowledge. The definition of sustainability based on the Indiana University Bloomington (IUB) office of sustainability is "meeting the needs of present without compromising the ability of future generation to meet their own needs". The problem is always associated with the application of this definition and the difficulty rises from different issues like:

- Rapid increase of human population
- Limited resources and alternatives
- Absence of moral and ethical values to really solve problems the right way and the lack of commitment
- The denial syndrome that marks the modern society in refusing to believe that there is/are problem(s)
- Faith in technology to resolve problems
- Increased industrialization

Objective:

Based on the above, it is important to address some of the issues listed earlier. The main objective is to tackle the problem from two directions. One direction is based on application of what students learn from geology courses like understanding the processes involved, their influence, the scale of these processes and influence and the assessment procedure and method used.
The second direction will be related to the understanding of eco-literacy and its relation to ecosystems and sustainability.

Outcome:

The learning outcome obtained in the physical geology class is to create educated, responsible and ambitious generation that is able to recognize the practical applications of geological concepts, principles and methods in sustainability. Furthermore, to acknowledge the contribution of geological sciences in making positive changes concerning the environment. Misunderstanding and misjudgment are always some of the issues related to earth sciences. Misconception is always floating around topics like mineral mining and extraction. Mineral mining and extraction will lead to pollution and land abuse!

Awareness is another concern. It is understood that some students will reject learning eco-literacy based on lecturing but they will be more willing to explore its meaning through indirect problem-solution situations that will influence their lives, hence lives of others.

The learning outcome of the assignment is mainly to set sustainability goals. Such goals are supposed to give results related to society and not just isolated and separated from the whole community. In addition, the goals should be dynamic, that is, not only to manage or resolve certain issues but also are achievable. Such goals are better than impractical solutions that could be wonderful but are very difficult to accomplish. This requires from the person that is dealing with any environmental problem to know the surroundings around him/her for best evaluation. Knowing the surroundings around an individual is one of the important steps to learn eco-literacy and is, at the same time, a key to open the doors of the internationally growing umbrella of sustainability.

Students that would be involved in the following assignment or activity should observe, describe, compare and suggest solutions based on the knowledge they gained from studying geology. In doing so, students should always remember that there is an overlapping and interference between nature and humans and they should work as if the two components are actually one, not forgetting that culture, social life, religion, economics and politics should be considered.

Activity:

<u>First stage:</u>

The first part of this activity will be related to thinking. Two environments (locations) will be given like Arizona (arid-desert) and Florida (humid). Students are required to answer some questions like:

1. What is the average annual rate of precipitation for Arizona and Florida? Students can use this website: http://www.currentresults.com/Weather/US/average-annual-state-precipitation.php
2. What are the sources of water in the two states?
3. What would be your general reaction towards water sources in these two environments?
4. What are some problems that could rise concerning water supply in each state?

5. List some of the actions, procedures and plans that would be applied, for the two states, concerning any problem related to water sources.
6. Will long-term solutions be considered? If so, for which, state and why?

This part will be practiced during the lecture time for forty-five minutes and ideas would be exchanged.

Second Stage:
The second stage of the activity will be related to some practical investigation and exploration of eco-literacy. Students will look for buildings here at MVCC that are following Leadership in Energy and Environmental Design (LEED) requirements. Students will evaluate the different buildings by searching for sustainable features. Buildings with highest score will get the LEED certificate.
This part can be accomplished during the whole period of lecture or lab and students with the aid of the instructor could prepare a list of sustainable features for building.

Third Stage:
The third stage is given as field trip where students will locate different sites outside the campus to describe situations and problems that may exist. Different topics could be introduced and used and one of them is ground water.
The objective of this stage is to evaluate the possible source of contamination/pollution for groundwater and the possible flow or path of the contaminated groundwater in the area that is around MVCC or in general, Palos Hills area. Flow and water table contour lines are used to construct potentiometric surface map.

Steps:

1. Students will locate natural and man-made lakes/ponds at MVCC and the area around the campus using Palos Hills quadrangle topographic maps.
2. Using GPS systems (cellular phones), the depth of water table will be obtained for each lake and pond. Water table in this area is close to the surface therefore water in lakes and ponds is same as water table.
3. The depth of water table at the different lakes will be used to construct water table contour lines. Water table contour lines are lines that connect points of equal elevation of water table from the sea level.
4. From water table contour lines, groundwater flow lines will be established producing potentiometric surface map.

Results:

The potentiometric surface map will indicate direction of flow for groundwater and if a stream is gaining or losing stream hence giving the possible path of contamination for other areas. These maps could also be used to calculate rate of motion and also to assist in preparing water resource plan.

Questions and Concerns:

1. Are the lakes and ponds man-made or natural?

2. Is there any source of contamination or pollution close to the studied lakes and ponds?

3. Are there any landfills in this area?

4. If there is, what is the nature of it (material)?

5. Is the source of contamination or pollution close or far away from MVCC campus?

6. Fill the following table:

Name or Number of lake/pond	Elevation of water table from sea level	Rank of lake/pond (Similar or close water table elevation should be considered same rank)

7. Are there any streams or creeks close to lakes/ponds?

8. Are the streams gaining or losing streams?

9. If contamination or pollution is far away from the MVCC campus, does that mean that the campus location is safe from the influence of contamination/pollution?

10. Define ecosystem.

11. Give some examples of ecosystems at or close to MVCC.

12. Are some of the ecosystems given earlier, influenced by contamination/pollution discussed above?

13. What measures should be taken to overcome this problem?