

STUDENT EMERSION IN ENGINEERING AND GESOCIONES RESEARCH: ONE-WAY OF STRENGTHENING THE DISCIPLINES



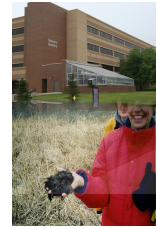
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Abstract

As studies show, the population of the science and engineering (S&E) community is aging, it is becoming important to get the young S&E students 'hooked' early in research. We can achieve this by building research projects into some upper level courses in addition to independent studies or research. Since there are environmental problems and issues that need to be addressed, involving undergraduates early becomes necessary, as they will continue with research that will help address environmental problems/issues. Several courses where research has been integrated as part of the requirement include, but are not limited to these: engineering geology, water resources management, environmental engineering, environmental geology, and hydrogeology. In many of these courses, the research component may account for 30 to 60% of the course grade. Large projects are broken into bite size for students to complete within a semester. Other students have either extended the research project or gone to graduate school to conduct similar research projects. Several research projects from some of these courses have resulted in regional, national and international presentations and publications. The vast majority of the more than 50 students that participated in the research projects found the experience pleasant. Selected students research projects are listed.



Background Information:

As the population of the science and engineering (S&E) community aging, it becomes imperative to get students in the pipe line, especially in the highly skilled areas if the S&E community is to remain viable.



Sample projects:

Examples of research projects include the examination of poor drainage, soil pollution, erosion, flooding and other environmental pollution problems. Factors responsible include inadequate maintenance of drainages and abandonment of faulty inlet drainages that result to flooding and environmental pollution.

Depending on the location of the school and other issues nearby, students could come up with research topics subject to instructors approval.

Below, we highlight the results of three projects

Result Summary:

Professors embedding research as part of their upper level undergraduate courses have resulted in students participation in more than 50 research reports presentations

Some students have continued to graduate schools within engineering and geosciences

Societal related issues are also being addressed with the undergraduate research projects.

Student mentoring is taking place while growing future young professionals and hopefully sustain the S&E community

Problems:

Increasing population creates an increasing demand on available water and other natural resources.

Insufficient number of new professional to replace ageing professionals.

Not enough program designed to increase the number of young professionals, or to place them in mentored positions.



We need to train and pass on the baton to the future scientists and engineers through research projects



Project 1. Effect of disinfectants on sewage degradation:

This project examined the effect of using "Izal" and "Dettol" disinfectants on sewage degradation. Disinfection normally is used to destroy or inactivate germs or bacteria, but some of the bacteria are valuable for sewage degradation within septic tank systems. The inappropriate use of disinfectants and detergent in homes has contributed to septic tank failures in most homes and industries in Nigeria. The result of the project shows that the disinfectants increase the die-off rate of bacteria as the volume of the disinfectants increase, that pose a threat to effective sewage degradation and may lead to septic tank failures.



Project 2. Water quality along a river profile:

A study was conducted to see any change in water quality along a river during the year.

The result from this project shows high nitrogen and phosphate levels in some areas during the planting season. The areas need to be looked into in more detail for the source(s) of the nitrates and phosphates.



Approach:

Embed student research projects in upper level engineering and geoscience courses. These projects account for 30 to 60% of the course grade.

Solid waste management is a big challenge in developing nations due to inappropriate disposal (illegal & open dumps) that may have adverse impact on both surface and groundwater quality.

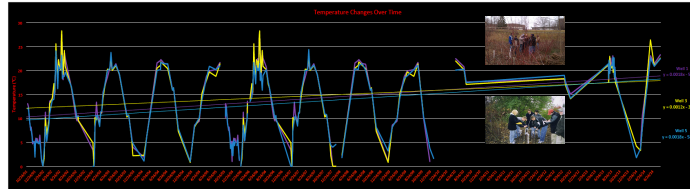
Other environmental issues that know no political boundaries abound & that could be incorporated in some engineering & geosciences courses



Project 3. Monitoring of well field:

This is an ongoing project that looks at the impact of Campus Activities on groundwater quality

One result from this study shows an increase trend in groundwater temperature; a local example of global warming?



Some Student research projects:

Small town water quality and health concerns... student is now in graduate school
Heavy metal composition of soils in some Nigerian Communities;
Water quality and the invasion of the St Joe River by cyanobacteria...all published in GSA abstract with programs volume 46. no 6, 2014

Possible Research topics:

*Land subsidence studies resulting from oil and gas, and mining

*Geo-mechanical aspects of the subsurface for building activities, underground storage of oil and gas, and waste disposal sites.

*Research towards more economical site investigation tools that are simple to operate. For example: shallow seismic, ground radar, remote sensing including laser and multi-spectral analysis.

**Strength properties, time-dependency and weathering of soils & rocks

*Geo-mechanical behavior of cemented soils and weak rock**

*Hazard and risk assessment for engineering structures in developing nations
*Research towards data processing and visualization tools of the subsurface for engineering works (two-and three-dimensional Geographical Information Systems)



Conclusions:

Undergraduates participation in embedded research as part of their course is found to be positive
Several research works have resulted in more than 50 presentations, encouraging students to continue in the professions

Acknowledgment:

Our thanks to undergraduate students at PFW and Covenant University who worked in research projects and to future students that will be involved in future research projects.