

Enhancing the Design, Communication, and Analytical Skills of Students through Problem Solving, GIS, and Natural Resources Conservation Modules and Tools

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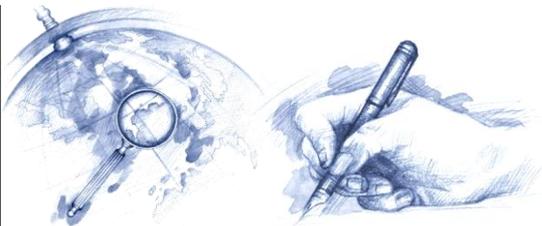
Biological Engineering Program
NC A&T STATE UNIVERSITY
Greensboro, NC



SAES Strategic Plan

The proposal will help the School of Agriculture and Environmental Sciences (SAES) to achieve its strategic plan. The SAES strategic plan has eleven themes (2005) and the proposal will satisfy the following five:

- Maintain a responsive learning environment.
- Enhance retention and graduation rates.
- Protect the environment and natural resources.
- Empower individuals, families and communities; and use innovative technologies.

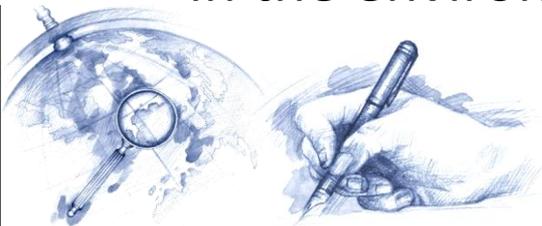


NIFA Goals



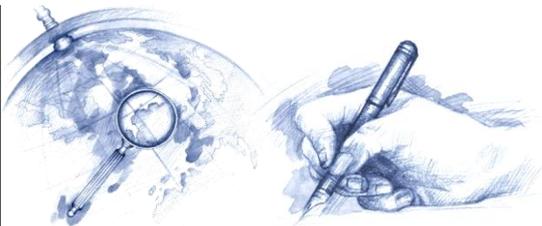
The project also supports the following NIFA Goals:

- Global food security and hunger
- To some extent global climate change.
- Additionally they will be using models and tools that can simulate the use of certain practices on nutrient losses to drainage water that may find its way to surface and subsurface waters and to use models or tools to determine impact of agronomic or cultural practices on carbon build up in the environment.



NIFA Goals cont.

- The project will prepare students with the opportunity to apply knowledge to the solution of real-world problems.
- Students will study soil and water conservation management and to stress to clients the impact of poor practices on environmental degradation and crop production.



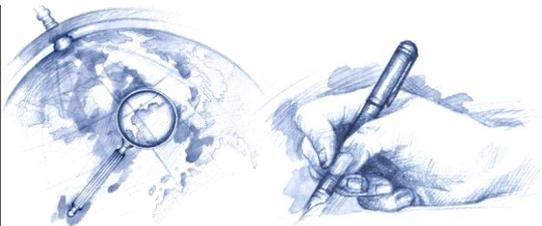
Identification of Educational or Research Problem and Project Impact

- Engineering graduates' skills in problem solving, communication and developing problem statements need to be improved.
- This concern is shared by employers both locally and nationally (Hart, 2008). While engineering students are required to take courses in English and technical writing, the link between writing and speaking and analytical and critical thinking and problem solving skills must improve and therefore, must be emphasized continuously.
- Language can create knowledge; revision can facilitate discovery (Horning and Becker, 2006).
- The project will address the inadequacies in communication, problem solving and analytical thinking skills through a series of student projects, reports and presentations, and in the write up and defense of their capstone designs.



Identification of Educational or Research Problem and Project Impact (Cont.)

- A student with good communication skills will be more marketable and beneficial to the company who hires him or her.
- Furthermore, students with improved communication, analytical and problem solving skills will be of value to the company at the local, national and international levels.

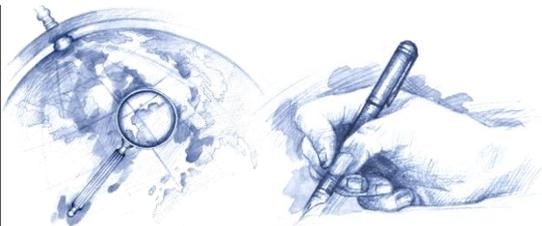


Project Innovations

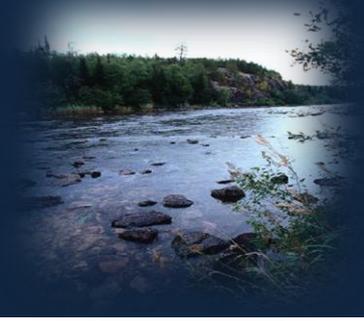


The project proposes to:

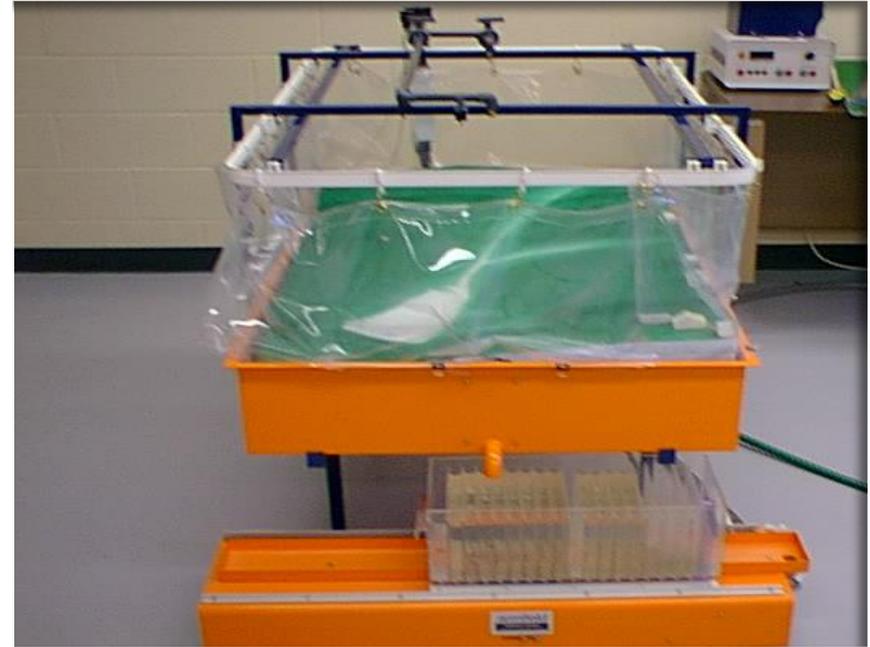
- Give undergraduates a thorough understanding of Soil and Water Management
- Maintain or improve soil health and water quality.
- Provide students with a strong basic knowledge of runoff, infiltration, evapotranspiration, soil water movement, and erosion.
- Students completing the modified courses should not only exhibit good problem solving skills but they should be able to develop and articulate problem solution statements to clients or the people they serve.



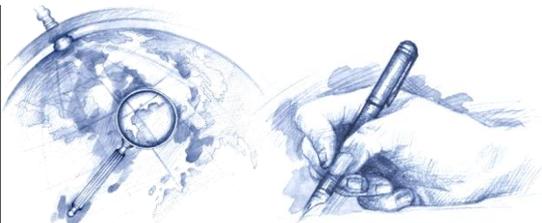
Natural Resources Conservation and Management



WATER FLOW SIMULATION UNIT



RAIN FALL SIMULATION UNIT



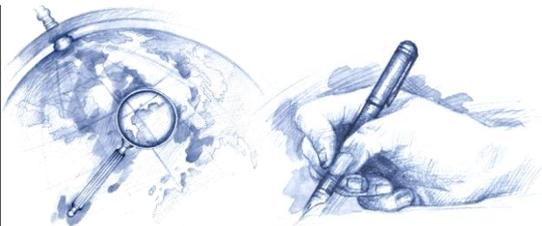
Maintaining Water Resources Equipment



CORE VALUES



The **core** values obtained by graduates are: competence in communication and problem solving, creativity, discovery, innovativeness, team work (diversity), global awareness, integrity and responsiveness.



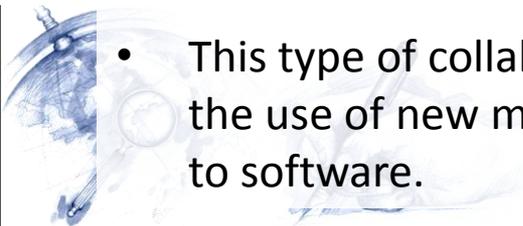
Identify Courses to be Modified

- This project will adopt computer models on Natural Resources Conservation Engineering that have been nationally and internationally accepted as robust tools for predicting pollution in agricultural and urban watersheds and to present a variety of scenarios to improve a safe supply of food and fiber.
- Selected courses will be modified and taught in an upgraded computer laboratory.
- Interactive programs were used to help students take part in a holistic process of learning and using theories and conservation tools for a sustainable future. Specifically; a Soil and Water Conservation Engineering course (BIOE 400), a Water Resources and Engineering course (BIOE 424), a GIS/GPS (BIOE216) and a Hydrology course (CAAE 364) were modified.
- These approaches will hopefully enhanced student learning and development by simultaneously introducing the theories and their applications.



Multidisciplinary and/or Problem-Based Focus

- The proposal is multi disciplinary-based.
- Disciplines include: Natural Resources, Engineering, Agricultural Business and Agricultural Economics and Mathematics.
- There are collaborators from USDA-NRCS East National Technical Service Center, North Carolina State University in Raleigh (NCSU). These persons are strong in the use and demonstration of stream bank restoration RUSLE and DRAINMOD Models respectively.
- The latter collaborators are involved in extension, research and teaching and should further lend their expertise to these areas to the benefit of the students.
- This will further strengthen partnership with USDA-NRCS at the national level and NCSU which is the other State institution (1862) in the State of North Carolina.
- This type of collaboration can lead to exchange of ideas in effective teaching; in the use of new models developed are modified by USDA and NCSU and the access to software.



Course Objectives:

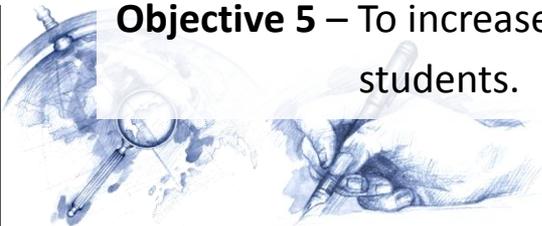
Objective 1 – To modify and improve the current introductory course in geographic information systems (GIS) and global positioning systems (GPS) so as to provide the necessary background for GIS use in upper level courses.

Objective 2 – To develop teaching modules that use existing tools such as: RUSLE, SWAT, APEX, HEC-RAS and DRAINMOD to enhance analytical, design and modeling skills.

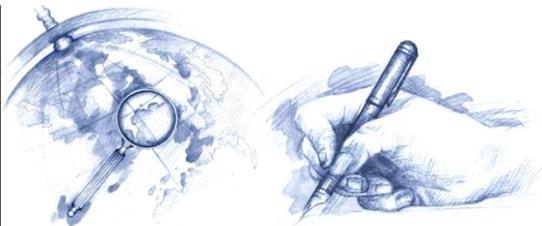
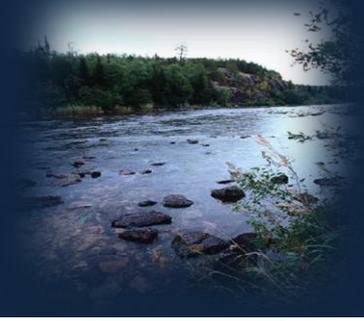
Objective 3 – To acquire a person that will serve to enhance the writing and oral communication skills of students in Agriculture, Engineering and Related Sciences.

Objective 4 – To upgrade the existing computer and water resources laboratories and classroom equipment of the Biological Engineering Program to enhance the methods of delivery and increase computing capacity.

Objective 5 – To increase enrollment and retention rates and graduation, by attracting quality students.



Upgraded GIS Computer Laboratory



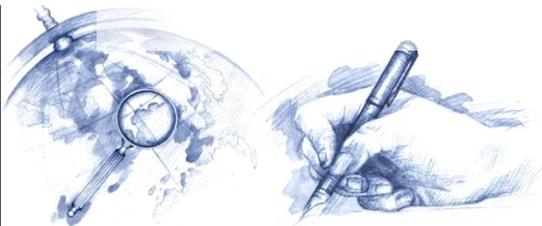
Products, Results, Measurable Outcomes (Impacts)

- Enhanced oral and written communication skills
- Improved design and analytical skills,
- Proficient in the use of computer simulation models and other software to improve management and environmental conservation practices (RUSLE2, ArcSWAT, HEC-RAS, ArcGIS and in understanding the basics of utilizing DRAINMOD for Nutrient and water Table Management)
- Enhance Marketability of Students
- Improve Graduate school acceptance.



Products, Results, Measurable Outcomes (Impacts – Cont.)

- Other outcomes are: increased enrollment and retention in the Biological and Agricultural Engineering Major and the acquisition of hardware and software to enhance our computing facility.
- Based on current demand for graduates with good communication, design and spatial analysis skills, this project will also have additional outcomes of increased marketability of graduates and increased employer satisfaction.
- Developing a writing guide to improve communication skills.



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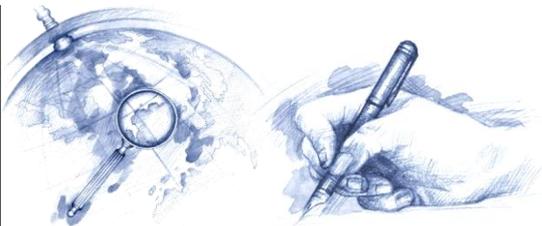
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QUESTIONS?

