Abstract

To improve retention and graduation rates for STEM students, the project team developed a comprehensive vision, known as SPARC or STEM Persistence and Retention via C3 (Curricula-Cohort-Centralization).

SPARC3 will:
1. Transform curricula through integration of inquiry-based instruction in introductory STEM courses
2. Develop a research methods course with an undergraduate research capstone experience
3. Reduce the unmet in-state financial need of cohort students by providing scholarships
4. Centralize STEM student support services within a center environment to include advising, faculty and peer mentoring, cooperative work experiences and/or undergraduate research experiences, and professional tutoring.

The mission of SPARC3 is to ignite student curiosity and to prepare future STEM professionals for success in an evolving work environment.

Inquiry-Based Learning Curriculum Change

Beginning Fall 2011, Gaston College committed to changing educational practices in introductory STEM classes to be more inquiry-based and to expose students to the authentic practices of STEM professionals. To accomplish this goal, a project team developed a comprehensive plan which included the development of faculty expertise to implement new instructional strategies in inquiry based learning (IBL) and course-integrated undergraduate research and piloting the project in three introductory courses, General Biology I, General Chemistry I, and Statistical Analysis.

The instructor for General Chemistry chose to use POGIL, and the instructor for Statistical Analysis chose to use Problem Based Learning (PBL). The instructor for General Biology I chose to use case studies and Problem Based Learning (PBL). The project plan which included the development of faculty expertise to implement new instructional strategies in inquiry based learning (IBL) and course-integrated undergraduate research and piloting the project.

In addition to the inclusion of inquiry based learning techniques in the curriculum of the three targeted courses, the project team also decided to include undergraduate research experiences in sophomore level courses. This experience was piloted in Genetics in Fall 2012 and will also be included in the newly designed course, Research and Measurement (to be held Spring 2014). In Genetics, the classroom was flipped and all lecture was conducted via a course learning management system outside of class. In class, students were asked to identify a microbial species from an environmental sample taken from either a land area managed for recreational use, or a land area managed for wildlife conservation. Students learned the various lab techniques (PCR, DNA isolation, genetic sequencing, bioinformatics, etc.) within the constraints of this project.

After one semester of including an undergraduate research experience in the classroom measurable gains were observed in student success rates.

Future Plans

Currently the project team is working to:
- Gain additional funding to create cohorts, and a STEM center on campus, (2014)
- Create partnerships with four-year universities to enhance undergraduate research (2014)
- Expand inquiry-based learning and undergraduate research to other departments within the Arts and Science Division (2016)
- Expand inquiry-based learning and undergraduate research to all divisions (2020)