

# CUR Focus

## Raising Student Awareness of Research Opportunities at Georgia Gwinnett College

### Introduction

As the nation's first four-year public college established in the 21st century, Georgia Gwinnett College (GGC), located in Lawrenceville, Georgia, has grown from fewer than 200 students in 2006 to an enrollment of more than 9,500 in the fall of 2012. Since its inception, one of the college's guiding principles has been the innovative use of educational technology to enhance student learning (Kaufman 2007).

When the School of Science and Technology (SS&T) was established at GGC in 2006, faculty members were heavily engaged in curriculum and program development for majors in the sciences and technology. Because of this focus, few SS&T faculty members engaged in research from 2006 to 2008. Also during that period, only a handful of students had progressed far enough in their majors to participate in undergraduate research.

In an effort to codify the undergraduate research requirement for majors in the STEM (science, technology, engineering and mathematics) disciplines, a research course, STEC 4500, was developed and offered in the spring of 2009. This course was specifically intended to be multidisciplinary so that students majoring in any STEM discipline could conduct research as part of their undergraduate experience.

An initial challenge faced by the college was linking students with faculty members conducting research. During this early period, students had to search individual professors' web sites and Wiki pages to find out which faculty members were conducting research on topics that interested them. Faculty often had to solicit students from their classes for collaboration on research projects. While this informal system worked initially because of the relatively small number of students and faculty in SS&T, as student enrollment increased in the fall of 2009, it became evident that a more formal approach was necessary to raise student awareness of available research opportunities.

We will describe here four initiatives that the School of Science and Technology has undertaken to promote students' awareness of the undergraduate research opportuni-

ties available and to promote the growth of our undergraduate research program. These four initiatives include:

1. The establishment of robust web-based research resources,
2. Student-faculty "meet and greet" sessions,
3. The Science, Technology and Research Show (STaRS) that showcases the work of our undergraduates, and
4. Implementation of a four-year Undergraduate Research Experience that allows all SS&T students to be engaged in authentic research during all four undergraduate years.

These initiatives have served not only to improve students' interest in STEM research, but also have enabled better matching of student research interests to faculty research projects. Additionally, students are afforded the opportunity to present the results of their research efforts in a professional conference setting to their peers, future research students, graduate-school representatives, and faculty.

### Undergraduate Research Initiatives

**Web resources.** Beginning in fall 2009, the School of Science and Technology embarked on a plan to provide students easy access to all available research opportunities. The Undergraduate Research Committee, at the request of the dean, developed both open and limited-access web pages where faculty could post current and proposed research projects in which students enrolling in STEC 4500, the research course, could participate. The open web page, found at <http://www.ggc.edu/academics/schools/school-of-science-and-technology/faculty-student-research.html>, describes current undergraduate research projects. This page also contains the course syllabus, the student-faculty research agreement form, and a list of the research-active faculty along with a short description of their research interests, as well as a link to the limited-access web page. The limited-access web page has the same information, plus a list of future research

projects available for the following semester. Both web pages are continually updated so that students always have a current selection of research projects from which to choose. Whenever a faculty member develops a research program that will engage students in the STEC 4500 course, the project is added. Conversely, when faculty members' projects conclude, those projects are removed from the sites.

The limited-access web page, which is available to all Georgia Gwinnett students, staff, and faculty, contains the following information:

- STEC 4500 undergraduate research proposals, including faculty members' descriptions and requirements for student participation.
- STEC 4500 documents and research forms, including
  - o The STEC 4500 undergraduate research syllabus. This general syllabus provides guidance to faculty and students engaged in research, including minimum course requirements and deliverables.
  - o The students and faculty research agreement form. This document serves as the "contract" between students and their research advisors and specifies research tasks, responsibilities, and deliverables.
  - o The faculty research proposal template.

The faculty proposal template includes:

- Project title
- Research advisor(s)
- Project description. Projects are described in enough detail to ensure that interested students have a good general idea about what the research will investigate.
- Research goals. The research faculty advisor outlines what constitutes the project's success.
- Expected outcomes. Research faculty members propose venues for likely presentation of the research, for example, the college's Science, Technology and Research Show (STaRS), conferences, and/or papers.
- Enrollment requirements for students. Course prerequisites and other requirements for students are provided.

- Conference and presentation opportunities. Local, regional and national venues for student presentations are listed.
- External research opportunities. Extramural opportunities for students to engage in research, such as internships and institutions that offer summer REU programs, are provided.

The goal is simple—to provide our students with a "one-stop shop" to familiarize themselves with research opportunities at GGC and enable them to locate potential faculty sponsors. Faculty also benefit from the ability to advertise their research plans and seek collaboration in a venue available to all students, not just those enrolled in their classes.

***Student-faculty "meet & greet" sessions.*** In the spring of 2011, SS&T initiated a student-faculty STEC research "meet and greet" session where students interested in undergraduate research could learn more about current faculty research initiatives. By 2012, the number of students and faculty participating in this event had nearly doubled. During these sessions, many students have commented that the SS&T research web page was very helpful in helping them select a faculty advisor and research project.

***Science, Technology and Research Show (STaRS).*** Beginning in 2008, the School of Science and Technology organized and sponsored a science show called the GGC Twitter, which featured poster sessions of student-faculty research. By 2009, SS&T leaders recognized that the breadth of student-faculty research required an annual research expo with broad public appeal. Thus in 2010, SS&T convened the first Science, Technology and Research Show (STaRS) to highlight both educational and STEM research activities engaged in by students and faculty. This event features formal student-led research talks in a conference-style setting, student-faculty research poster sessions, and participation by regional science and technology companies and graduate schools. Attendance has grown each year. STaRS is widely attended by GGC students and faculty, as well as by local high-school students interested in the STEM disciplines. It was estimated that more than 1,000 students attended the 2012 STaRS event.

STaRS 2012 also featured a table where students could obtain information about STEC 4500 research opportunities.

Students interested in a project could add their name, email, and other contact information. Student interest was high and more than 50 students signed up for various projects. The sign-up sheet was then distributed to faculty so that they could follow up with students.

**Four-Year Undergraduate Research Experience.** At GGC, all students majoring in science and technology are required to complete either undergraduate research or an internship in their junior and/or senior years. However, we recognized the need to introduce systematic investigation and research experiences much earlier in a student's educational career, in accordance with the current literature (Seymour, 2004; Wei, 2011) as well as many current reports by the American Association for the Advancement of Science and the National Research Council (see References). So in 2011, we developed a model (the Four-Year Undergraduate Research Experience) that allows all SS&T students to be engaged in authentic research during all four years of matriculation.

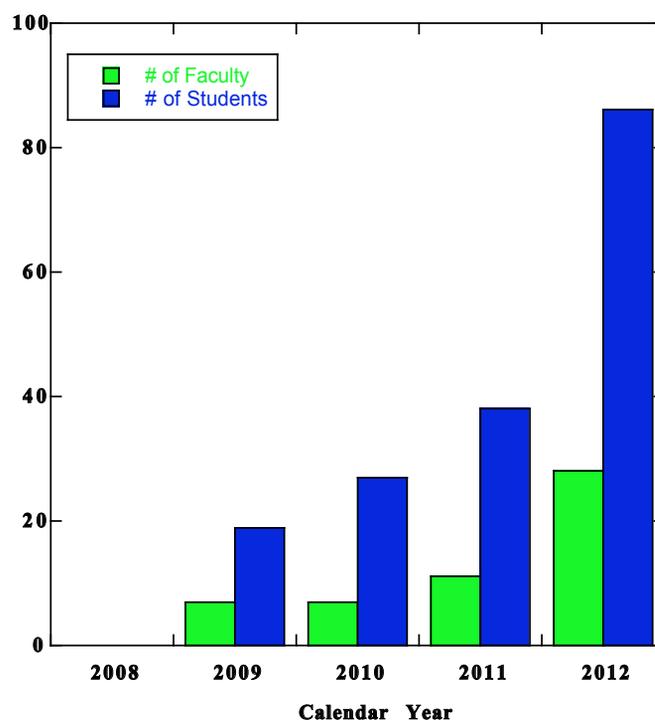
Our model utilizes course-embedded research that promotes critical-thinking skills and identifies the research skills to be developed in a variety of courses (Awong-Taylor 2012). In 2011 we redesigned and implemented authentic research experiences in 17 courses, nine of which were at the freshman and sophomore levels. Although this initiative is in its second year, we are seeing a few students continue to use some of the research from these courses as STEC 4500 projects. Course-embedded research allows students to engage in research-oriented experimentation, provides them with insight into how research is conducted, and, we hope, heightens their interest in STEM research. The four-year program was funded through a University System of Georgia STEM Initiative II Grant.

## Growth of Undergraduate Research

Due to our research initiatives and the tremendous growth in student enrollment at GGC, the number of students majoring in STEM fields has increased dramatically. In addition, the number of faculty members listing undergraduate research projects on the SS&T research web page doubled between the fall of 2009 through the fall of 2012. Figure 1 outlines the growth in STEC 4500 students and research-active faculty from 2008 (before the STEC 4500 course was

initiated) through the current academic year. Data for 2012 do not include projected numbers of STEC 4500 students and research-active faculty for the spring of 2013, but those numbers are expected to grow as we approach registration for the spring semester.

**Figure 1. STEC 4500 Student and Research-Active Faculty Growth at GGC**



Several trends are evident in Figure 1. As the data from 2008 to 2009 show, few students and faculty were involved in research prior to establishment of the STEC 4500 course and the SS&T research web resources in 2009. In spring 2009, three students were enrolled in STEC 4500 and since then the number of students participating in collaborative STEC 4500 research has grown more than 28-fold. During that same period, the number of faculty engaging in STEC 4500 research has increased four-fold. While it is still not clear whether the four initiatives described above played a direct role in such rapid growth, we are confident that some or all of these initiatives are contributing factors.

Students do have an option to either enroll in undergraduate research or participate in an internship. Table 1 shows enrollment data for internships and undergraduate research from 2008 to 2012. Enrollment data from 2008 to 2011 are fairly similar. However, in 2012 enrollment in the undergraduate research more than doubled compared to participation in internships, which actually decreased. Most of the initiatives described above were implemented in 2011. The missions of the institution and the School of Science and Technology did not change; the only difference that could account for the change in numbers for 2012 was implementation of the research-oriented initiatives. We believe that some of these initiatives did contribute to interest and growth in undergraduate research.

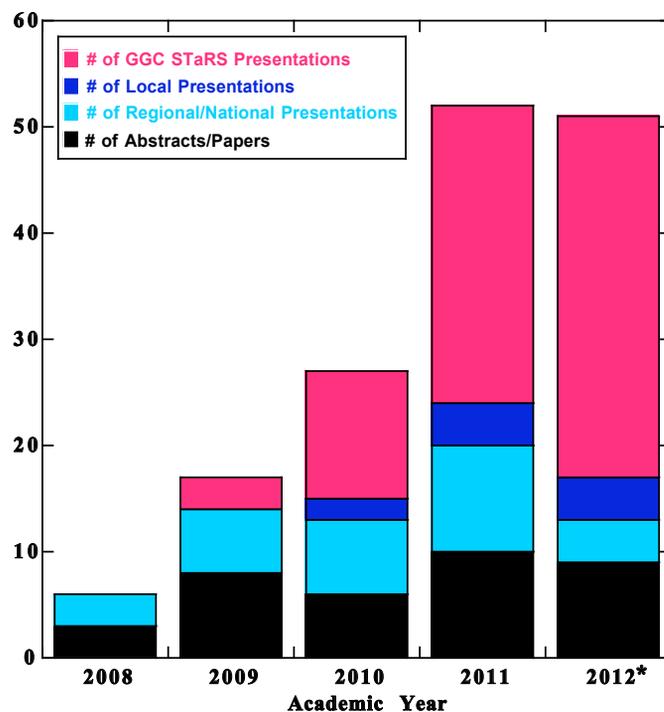
**Table 1. SS&T Internship and STEC 4500 Research Enrollment, 2008-2012**

Calendar Year	Students Enrolled in Internships	Students enrolled in Undergraduate Research
2008	3	0
2009	9	19
2010	29	27
2011	42	38
2012	37	86

An important consequence of the growth of the STEC 4500 research course has been a dramatic increase in the output of scholarly presentations, abstracts, and papers. See Figure 2.

Presentation venues range from those at GGC STaRS and local conferences to regional and national science conferences such as those of the American Chemical Society. As the data show, the GGC STaRS event has developed into a major venue for our students' STEC 4500 research results, with presentations tripling since 2010. Abstracts and papers published based on STEC 4500-related research include a mix of non-peer-reviewed and peer-reviewed conference proceedings and scientific journal articles. Note that the scholarly output reported for 2012 does not contain data for the spring semester of the 2012-2013 academic year; we do

**Figure 2. Growth of STEC 4500-Related Scholarly Output at GGC**



\*Summer and Fall data only

anticipate the publication of additional scholarly presentations and papers during the spring.

From the modest beginnings in 2009 when our research initiatives began, total scholarly output—including presentations and papers—has tripled in three years. As our program continues to develop, it will be important to expand presentation of research at more national conferences and publication in peer-reviewed journals. Given high faculty teaching loads and the relative youth of the college and program, however, we anticipate that publication in peer-reviewed journals will eventually increase as more research is collected and collated.

## Conclusion

Undergraduate research opportunities and activities in the STEM disciplines at GGC have increased steadily since the implementation of the SS&T student-faculty research web pages. The number of faculty and students conducting research has almost quadrupled since 2009, due in part to our increased enrollment, but also as a result of successfully leveraging our initiatives to improve student awareness of the research process both in the classroom and in the more traditional research setting. In addition, STEC 4500 research conducted at GGC has resulted in significant growth of the scholarly output of both students and faculty—an important trend if we are to spark and maintain our current and future students' interest in the STEM disciplines.

As our college grows, new STEM majors will be developed, new facilities will be built, and additional courses will be redesigned to embed research. With our four initiatives in place, we anticipate that STEC 4500 course-related research opportunities will double in the next three to five years. The next stage of our STEC research program must include ways to encourage and expand publication of research results in peer-reviewed journals.

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