

Science to Serve

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Submitted by

Office of Academic Outreach: Ruth Eilers

Department of Biological & Environmental Sciences (School of Liberal Arts & Sciences): Bob Chandler and Bill Wall

Department of Chemistry & Physics (School of Liberal Arts & Sciences): Ken McGill

Early Childhood and Middle Grades (John H. Lounsbury School of Education): Karynne Kleine

Science Education Center and the Department of Chemistry & Physics (School of Liberal Arts & Sciences): Rosalie Richards

Science to Serve

Abstract

A low level of scientific knowledge among the U.S. population has considerably hindered its economic preeminence and social development. *Science to Serve* is a distinctive framework at GCSU that embraces a significant number of formal and informal interdisciplinary practices with the single purpose of advancing the interest, engagement, and understanding of science and technology by people of all ages and backgrounds. That is, *Science to Serve* aims to make science “real” to those who might not ordinarily be engaged so that they see the role of science to life, in education, and to the economy. Primary support for this unique framework comes from the Office of Academic Outreach, the Department Biological & Environmental Sciences, the Department of Chemistry & Physics, the Science Education Center, and faculty from Middle Grades Education. This rich tradition of effectively communicating and instilling the usefulness of science to diverse communities has resulted in an impressive host of resources, programs, courses, and activities that are cross-disciplinary in scope. *Science to Serve* garners broad-based support from the university community and myriad constituencies beyond the campus with faculty and students of all majors serving as ambassadors of science. Partnerships with key statewide and national organizations have further strengthened this initiative and external funding has exceeded \$2 million to date. For a relatively small liberal arts university in a rural location, this remarkably large number of resources focused on civic engagement through science is extraordinary. The *Science to Serve* framework will provide a cohesive, coherent and comprehensive structure that will greatly enhance opportunities for acquiring external support if selected as one of GCSU’s academic programs of distinction.

Program Description

Many scientific discoveries have strong social and political ramifications and require a scientifically-literate population for wise decision-making. Yet the current scientific literacy of Americans is a bit suspect. Such low levels of scientific knowledge considerably hinder the nation's economic preeminence and social development. Georgia College & State University has amassed a remarkable number of resources with the single purpose of improving the scientific literacy of those that we serve. Known as *Science to Serve*, this powerful framework of formal and informal interdisciplinary practices, as a whole, advances the interest, engagement, and understanding of science and technology by people of all ages and backgrounds. *Science to Serve* embraces varied programs, departments and schools and has an outstanding tradition of effectively communicating and instilling the usefulness of science to diverse communities. The source of our distinction emerges from the extraordinary collection of resources that we possess *to make science "real"* to those who might not ordinarily be engaged so that they see the critical role of science to life, in education, and to the economy. Support for this distinctive framework comes from the Office of Academic Engagement, the School of Education, and the School of Liberal Arts & Sciences. The primary departments sustaining these collaborative efforts are Academic Outreach, Biological & Environmental Sciences, Chemistry & Physics, the Science Education Center, and faculty from Middle Grades Education. The dynamic nature of this framework has resulted in over 20 courses including international courses that span the globe.

The activities, programs, projects and courses that have and will result from the *Science to Serve* framework will be housed at the Science Education Center (<http://chemphys.gcsu.edu/sciencecenter/>).

Mission Centrality

"Georgia College & State University aims to produce graduates who are well prepared for careers or advanced study and who are instilled with exceptional qualities of mind and character. These include an inquisitive, analytical mind; respect for human diversity and individuality; a sense of civic and global responsibility; sound ethical principles; effective writing, speaking, and quantitative skills; and a healthy lifestyle. GCSU seeks to provide communities and employers with graduates who exhibit professionalism, responsibility, service, leadership, and integrity."

One could achieve nearly every outcome of GCSU's mission statement through the proper practice of science--the intellectual development that accompanies science understanding, the effective communication and mathematical skills that producing and sharing science knowledge requires, and openness to diversity and the recognition of the need for a healthy lifestyle that science research advances almost go without saying. But those attributes could be found at most any university. The academic development that we offer at GCSU that fosters its mission and is unique to this institution is a focus on civic responsibility and service. Our programs promote *"science to serve."*

The National Science Education Standards (National Research Council, 1996) presents a vision of a scientifically-literate citizenry that is embodied in GCSU's mission statement above. Because an understanding of science offers unique satisfaction and stimulation, because problem-solving is at the heart of the discipline and its incorporation is so important to the future success of the United States and Georgia, GCSU's contribution of numerous programs that uphold *"Science to Serve"* makes it distinct. While other Georgia institutions promote science education for the public good, such as Columbus State with its Astronomy Center and those with NSF-sponsored PRISM sub-grants, only GCSU has at its core the mission to advance excellence AND equity through its *"Science to Serve"* framework. We go beyond teacher preparation and science outreach to K-12 schools to ensure that graduates of GCSU have had opportunity to put their science education to work for the public good.

Students of all majors who serve the community as Community Action Team for Service (CATS) outreach science ambassadors, the grants that Arts & Sciences and Education faculty routinely co-propose and implement to advance area teachers' knowledge and skills, the research undertaken by professors with their students to address community concerns such as "The Oconee River Project", and the school children

who energetically tour the on-campus natural history museum, all are examples of the distinctive twist that GCSU alone offers in developing a scientifically literate populace. Projects of this nature both personify and cultivate integrity, responsibility, and service. When numerous undergraduate and graduate students embark on science journeys at GCSU it is with the secure knowledge, and expectation, that what they are doing and learning can improve the world.

Students who are science majors also benefit from GCSU's framework. It is widely recognized that the traditional ways of teaching are losing their effectiveness for a changing student population. Additionally, students of different backgrounds and level of preparedness have a variety of learning styles that are often not acknowledged when required to learn only through the traditional lecture format (or not at all). Adding to these factors is the increasing need to create delivery mechanisms to reach a wider constituency. This can result in a lowering of learning outcomes, problems with student attendance and retention, and a general feeling of student dissatisfaction with science courses. Many students have an interest in science but are not prepared for the rigorous, unforgiving nature of the discipline. Their interest is slowly worn away by attempting classes for which they are ill-prepared and feature "stand and deliver" instruction. In many traditional science and engineering schools students are assaulted with a battery classes that is more a test of their ability to withstand fragmented, impersonal presentation than it is of their ability to address complex tasks. GCSU takes a special approach of weaving the outcomes of a useful science education with a liberal arts education that emphasizes global citizenship. We do this so that our students and constituents learn to value the educational journey more so than mindlessly pursuing the goal of acquiring the degree. While recognizing that GCSU students must acquire the same problem solving abilities as their counterparts we keep the reason for these abilities at the forefront of the educational experience.

GCSU's science education programs aim to change society's perception of science by creating a culture of science understanding at all levels. We see ourselves as serving our world by creating ordinary members who understand science and can use it to improve the world themselves. The science we embrace and promulgate at GCSU is one of action and empowerment. Rather than giving students fish, we are teaching them how to do so themselves.

Capitalizing on Existing Strengths

GCSU has been named a Top 20 public university by *U.S. News & World Report*, and in 2005 was rated 15th in the southeast. That same year, the university was designated a "College of Distinction", the only public university in Georgia to receive this honor (U.S. News & World Report, 2005). As a program of distinction, *Science to Serve* will further elevate GCSU's national status by demonstrating excellence in civic engagement through science among students and a commitment to a shared mission of public responsibility. In fact, since 2002, GCSU's School of Liberal Arts & Sciences has been a member of SENCER, a national movement that aims to strengthen the non-scientist's capacity to become an engaged citizen by teaching *through* science as it relates to complex and unsolved public issues, such as AIDS (SENCER, 2007). Components of this approach have been adopted by several SOLAS faculty teams, including Drs. Tom Toney and Brian Mumma (course: *Sex & Drugs: Human Biology*), Mike Gleason and Megan Melancon (course: *Critical Literacy and Genomics*), and Julia Metzker and Amy Kelley (course: *Necessities of Life*). These co-taught courses have significant scientific dimensions but empower the student's sense of decision-making both as a person and as a public servant.

GCSU is also a member of the prestigious Council of Public Liberal Arts Colleges (COPLAC), an organization of publicly funded institutions with a strong dedication to liberal arts. Of all COPLAC schools, only three (College of Charleston, Sonoma State University, and Truman State University) have accredited

science programs and schools of education (COPLAC, 2007). *Science to Serve* at GCSU is distinctive in that it has a distinguished history of service through active partnership with the School of Education. The collaboration has fostered joint ownership of teacher preparation and K12 education issues by science and education faculty and has led to a number of high demand science outreach programs such as:

- Summer workshops for in-service teachers (ex. Physics for Science Teachers Workshops)
- Graduate school preparation programs (ex. Pre-Health Honors Corps Initiative)
- Scientific summer research for middle and high school students (ex. ACS Project SEED)
- Numerous academic camps and campus-wide visits by K12 students
- A host of after-school programs for elementary grades students
- Annual scientific competitions (ex. the Georgia Science Bowl, GCSU Regional Science & Engineering Fair, and the Problem-Solving Bowl) and
- Community programs (ex. Family Fun Night).

There is a natural culture of faculty-student collaboration due to the low student-to-faculty ratio and small class sizes. This alone is not unique to liberal arts universities or COPLAC institutions (Pope, 2000). However, a serendipitous benefit to the science culture that is unique to GCSU is the extensive number of learning experiences available to students *outside of the classroom* that is rare at science and engineering schools nationwide. These activities propel current students to achieve greater expectations, make connections between what they learn in the classroom and the real world, and inform prospective students of what to anticipate at GCSU. As a program of distinction, *Science to Serve* would attract the type of student willing to be involved in the life of the community, who is interested and willing to grow and whose understanding of public service is heightened by the many opportunities in science afforded at GCSU.

For a university population of just over 5,000, GCSU boasts a disproportionately large number of remarkably active science clubs that are student-governed: the Astronomy Club (Milledgeville SkyWatchers), the Beta Beta Beta National Biology Honor Society, the Chemistry Club, the Environmental Science Club, the Society of Physics Students, and the Women In Chemistry Alliance. Service to the community is at the heart of each club's mission. Every year, more than 200 students collectively contribute over 1,000 service hours to science programming at K12 schools, to veterans and the elderly, to service organizations, to inmate populations, and to the general community. This rich tradition of service through science has not gone unnoticed at the national level. In 2006, for example, the GCSU Chemistry Club, a student affiliate chapter of the American Chemical Society, received a Commendable award for its chapter's activities to further the knowledge of chemistry to the community. This honor will be bestowed at the 233rd ACS National Meeting in Chicago. Out of 980 student-affiliate chapters nationwide only 56 were recognized as Commendable, and the Chemistry Club was the only chapter in Georgia recognized as Commendable. In 2005, the Chemistry Club was one of 75 chapters to receive an Honorable Mention and they have set a goal to be recognized as an outstanding chapter in 2007.

Each partner of the *Science to Serve* initiative has done an extraordinary job of capitalizing on existing strengths. The opportunities presented by this exciting structure within the GCSU framework will further strengthen the existing collaboration and attract new partnerships (Maurrasse, 2001).

Potential for National Distinction

There is an impressive host of diverse resources already contributing to the distinctiveness of the "*science to serve*" framework. Foremost among these are:

- The Science Education Center, directed by the Kaolin Endowed Chair in Science (\$1 million endowment), with financial support from the state of Georgia and the kaolin industry
- The Natural History Museum with one of the top five collections in the southeast
- The Office of Academic Outreach directed by 12-month professional staff. (~\$250,000 endowment) with financial support from the kaolin industry and reaching ~7000 students annually
- The Georgia Power Endowed Chair in Environmental Science (~\$250,000 endowment)
- Numerous physical facilities dedicated to science research and learning such as Lake Laurel Biological Station; Bartram Educational Forest; Lockerly Arboretum; the Greenhouse; a Geographic Information System (GIS) computer laboratory; a nearly completed, state-of-the-art planetarium; and the Old Governor's Mansion
- The newly-renovated Herty Hall science building (with an additional \$4.8 million phase II addition)
- A strong history of grant procurement fostered by formal relationships between the School of Liberal Arts & Sciences and the School of Education
- A notable record of faculty and student research in the natural sciences resulting in national publications, presentations, and awards
- Partnerships with national and state agencies such as the Geological Resources Division of the National Park Service, the American Chemical Society, the American Association of Physics Teachers, the Georgia Department of Education, the U.S. Department of Energy, the Medical College of Georgia, the University System of Georgia Board of Regents resulting in funding of over \$1 million
- Formalized partnerships with educational and environmental organizations such as Oconee Regional Educational Service Agency, multiple area school districts, the Georgia Forestry Department, the Environmental Protection Division of the Department of Natural Resources, the Georgia River Network, the Georgia Department of Fish and Game, and the Gates Foundation-funded Georgia College Early College
- A robust record of innovative science courses to advance teacher knowledge and practice
- A program of internationally-renowned science speakers and local faculty who address timely science issues
- Faculty recognition by scientific societies for faculty leadership of, work with, and service to state, national, and international organizations
- Publication of highly successful and accessible college level biology textbooks and journals by GCSU faculty such as Discover magazine
- Television appearances on nationally-syndicated shows on The Learning Channel and the Discovery Channel

Collectively, these resources have amassed over \$2 million dedicated to preserving the rich heritage of service through science. Existing programs and projects within the *Science to Serve* framework and described below are particularly distinctive as evidenced by a track record to advance the interest, engagement, and understanding of science and technology by people of all ages and backgrounds.

Academic Outreach

For over 35 years, Academic Outreach has provided positive educational experiences for P-12 children of Baldwin and surrounding counties. Its mission is to promote a passion for learning while having fun and increasing students' awareness of their surroundings. The Office accomplishes this through inquiry and discover-based "hands-on" activities and non-traditional delivery systems at GCSU, at schools, and at local environmental centers *free of charge*. Programs include field trips, in-school visitations, after-school

programs, and camps. Programs focus on skill-building techniques such as teambuilding, community awareness, science and environmental education, music, math, English, art, and history appreciation. Activities and outcomes have been presented at various conferences and workshops including the Environmental Education Alliance Conference. The office also provides staff trainings and workshops for teachers and individuals in the community.

As a liberal arts university, practical applications of skills learned in the classroom are very important. Last fiscal year alone, Academic Outreach reached over 6,800 students in 6 counties through these activities! Programs were facilitated by undergraduate and graduate staff and volunteers with varying majors. During that fiscal, 116 GCSU students gave 2,537 hours to the community! No other COPLAC institution offers a program like GCSU's academic outreach. Compared with institutions nationwide, Academic Outreach is distinctive because it offers a broad range of free programs tailored to meet the needs of students of many populations, ethnic and financial backgrounds, and students of varying abilities whereas other institutions of higher education focus mostly on the "gifted", low income or special needs groups. Below, participants rave about their experiences with Academic Outreach:

"The students and teachers really enjoyed and were fascinated by all of the things in both the Governor's Mansion and the Museum. They are still talking about things they saw. Of course, your graduate students were a BIG HELP! Thanks for doing such a superb job!" --Noel Williamson Midway 3rd grade teacher

"Your program [camp] was great. I liked the hands-on activities, the enthusiasm of your instructors, the material that was presented and the team building activities. I'm just glad that the students finally got the concept of working together as a team." --Ranard Mattox, director of TRIO program

Natural History Museum

The Natural History Museum in Herty Hall is a university, community, and state research and academic treasure and is heavily utilized by many different constituencies on campus and beyond. GCSU biology students at introductory and advanced levels visit the exhibits to augment and reinforce lecture topics by examining actual specimens in the exhibits. K12 student groups and families come to marvel at the vast collection of artifacts. The natural history collection is fast approaching 10,000 catalogued specimens, just with fossils and fossil plants alone. In fact, GCSU is the only one out of the 24 COPLAC institutions with a museum dedicated to natural history. When GCSU was under consideration for COPLAC membership, the site visit team commented on how impressed they were by the collection. The museum also houses a modern collection of mammals, birds, fish and beetles. Compared to other museums in the state, including the Fernbank Museum and the Georgia Southern Museum (with primarily invertebrate collections), GCSU's Natural History Museum is the only research and exhibits museum. Additionally, it is free to the public. Research scholars from premier institutions such as the American Museum of Natural History in New York City (likely the single most important natural history museum in the world), the Carnegie Museum in Pittsburgh, and the University of Florida (which houses the largest collection in the Southeast) have visited Milledgeville to study the fossils. The glowing remarks from the following experts in museum-related research within the southeast underscore the distinctiveness of the museum:

"The vertebrate paleontological collection at GCSU contains many important specimens from Georgia, Florida, and the White River Badlands of the mid continent. They complement the collections at the University of Florida, Charleston Museum, and the South Carolina Museum of Science. The GCSU scientists that curate this collection are professional, cooperative, and knowledgeable. They have made their collections available to researchers from other institutions, produce important research, and as a consequence, are important contributors to paleontological research in the southeastern United States." --Richard Franz, Associate Scientist, Florida Museum of Natural History, University of Florida

"The University System of Georgia and Georgia College & State University should be proud of the distinctiveness of its Biology Department within the University System of Georgia. The Biology Department and the modern collection of fossils in the Natural History Museum at GC&SU are distinctive in their own right, but when used in conjunction with a dynamic, productive faculty and strongly qualified student body, they become even more effective for education, research, and service in Higher Education." Gale A. Bishop, Emeritus Professor of Geology and Member of the Graduate Faculty, Georgia Southern University; past director of the Museum of Geology in South Dakota

"The GCSU Natural History collections provide the State of Georgia with a unique resource for understanding biodiversity and change through time. The collections (vertebrate fossils, mammals, amphibians and reptiles, birds, fish, insects, and extant and fossil plants) are housed in modern facilities and curated by experts. The Department of Biological and Environmental Sciences at GCSU brings together faculty with diverse backgrounds and expertise that spans the biological sciences and encompasses related interdisciplinary fields. The synergy between the natural history collections and vibrant faculty at GCSU promotes excellence in education, service activities and relevant scientific research involving faculty, students and collaborators. My own visit to the GCSU collections was an incredibly productive phase of my dissertation work. I have visited a number of well known collections since then, but none have been as accessible and useful as those at GCSU." --Katherine McCarville, Ph.D., Assistant Professor of Geosciences, Upper Iowa University

In addition, the Geological Resources Division of the National Park Service and GCSU has an ongoing memorandum of understanding that allows faculty and students unprecedented access to park service resources. Through this agreement, GCSU students have been placed into paleontology internships at multiple national parks including one of the premier parks in the United States, the Grand Teton National Park. Normally, students must compete nationwide for park internships. For example, one such position at the Grand Canyon National Park actually drew over 10,000 applicants! Student access to such a resource is an example that sets GCSU's geology apart from other institutions.

The museum also houses a state-of-the-art planetarium which will be online in the near future. The planetarium will allow students and visitors to explore the universe in virtual reality. Major support of the planetarium comes from Grassmann Foundation and from the state of Georgia. As a *Science to Serve* program, the planetarium is one of the many GCSU science resources that make it distinctive.

Student Research

Both science departments have a long history of productive student-faculty interactions in scientific research. The thesis track within the master of sciences program in biology in the Department of Biological & Environmental Sciences adds to the productivity of student research in two ways: first, research-oriented graduate students can act as additional mentors for students; and second, the program allows graduates an outlet to complete projects that they started as undergraduates. Perhaps the most remarkable evidence of student research in the life and earth sciences is the number of co-authored publications in peer-reviewed science journals. In the last five years, faculty have published 87 articles (26 with student co-authors) and given 69 presentations/posters (48 with student coauthors) at scientific conferences. Faculty and students publish between 5-10 research articles per year in biology, environmental science, and geology (with an emphasis on paleontology). These students have presented at some of the most prestigious conferences such as the American Botanical Society, the American Society of Microbiology; the Geological Society of America and the Society of Vertebrate Paleontology. Often, GCSU students are the largest contingent of presenters at the Georgia Academy of Science Meeting; in some instances, the number of student speakers outnumbered those from all of the other University System of Georgia schools

combined. In the last five years, GCSU students have won more outstanding presentation awards at the Georgia Academy meetings in the biology and geology sections than any other institution in Georgia.

Similar gains have been observed in the Department of Chemistry & Physics. Over the past decade, the number of chemistry majors has quadrupled and in the next three years, the department will have graduated the third highest number of majors in the state. Although this growth makes the chemistry program unique statewide, this does not distinguish it from other institutions producing chemistry graduates nationwide. Rather, the department has set undergraduate research as its cornerstone of science education. As such, each chemistry faculty member maintains an undergraduate research group of at least four students. Undergraduate research is not generally expected or required by chemistry programs across the country. In fact, most chemistry programs do not require undergraduate research. At the March 2007 meeting of the American Chemical Society (ACS), there were only 188 undergraduate presentations of research. According to Chemical & Engineering News (2006) 10,947 students graduated with a chemistry degree nationwide. Given traditional retention rates, this corresponds to over 55,000 chemistry majors nationwide. Hence, less than 0.4% was involved in undergraduate research at the level necessary to be accepted for a presentation. 100% of GCSU chemistry majors are involved in research that is competitive on a national level and have ample opportunities to present their results at national meetings. In fact, over the last three years, the average number of GCSU chemistry majors presenting at the National ACS meeting was 30! This representation is larger than the number of students from a single university (graduate or undergraduate) in the southeast. Since each of these students gave a presentation, GCSU represented approximately 15% of the total undergraduate presentations nationally. But large numbers alone would not bring national distinction; this requires students to be exposed to academically meaningful research experiences that result in these presentations. This was demonstrated recently when a junior chemistry major received the Certificate of Merit from the Division of Environmental Chemistry at the 232nd National Meeting of the American Chemical Society in San Francisco. This certificate recognized her work for outstanding content material and her outstanding presentation skills. Awards of this nature are rarely, if ever, given to undergraduate chemistry students; rather, graduate students and postdoctoral fellows from around the world compete for this award. At this conference, over 12,000 scientists were in attendance with more 7,000 presentations given.

Producing Science Educators

The nation and the state are experiencing a crisis because of the negligible number of qualified high school physical science teachers being produced each year. The state requires that all teachers pass the Georgia Assessments for the Certification of Educators (GACE) in the area that they wish to teach. Since the first GACE exam was administered, to date, the failure rate is 100% for those attempting the exam in Physics. Hence, the state of Georgia has produced exactly zero qualified high school Physics teachers. As discussed earlier, a large contributor to this predicament is the traditional ways of teaching physics throughout the country. GCSU no longer has a physics degree but recent discussions between the Board of Regents and the department has lead to the prospect of creating a physics degree specifically geared toward producing high school physics teachers. Comparatively, the department has been highly successful at creating high school chemistry teachers. In fact, more chemistry majors have graduated from GCSU's MAT program in the past three years than in the entire history of the MAT program previous to this. This state and national crisis holds great potential for GCSU to gain national distinction. Chemistry, like physics, programs across the state do not produce many teachers. According to the Georgia Professional Standards Commission's status report (2006), there are only 252 certified chemistry teachers for the state of Georgia. Only 12 new teachers were certified in 2006, and three were from GCSU. Our number of

graduates may be low but the impact is large when our school represents 25% of the state production of certified chemistry teachers.

Level of Faculty Support

Science touches every aspect of a person's life: it drives the economy, it changes history, it defines health and healthcare, and it broadens artistic mediums. As such, every discipline at GCSU has contributed to the advancement of science, as shown earlier in the list of courses. The *Science to Serve* concept is based on teaching and science in innovative ways to increase literacy and relies on demonstrations of the synergistic relationships between the sciences, the humanities, and the arts. The Honors Program, Geography, the GIVE Center, Outdoor Education, Music Therapy, Mathematics, Creative Writing, and Health Sciences, to name a few, have been deeply engaged in the cross-pollination of arts, humanities and science for many years, broadcasting widespread support for this concept, resulting in new programs, clusters, international opportunities, research enterprises, workshops and so on. Moreover faculty shows its support for science and civic engagement by frequently presenting at and participating in seminars on scientific issues such as Dr. Doug Oetter's upcoming session on Environmental Ethics (2/14/07) and the Coverdell Institute sponsored Global Warming Teach-Ins (2/6/07). Faculty support is also demonstrated by securing regional and national speakers for scientific topics of local and international importance. These include the likes of attorneys from the firm of Black & Veatch on *Environmental Law in Georgia* (3/14/07), Dr. Tracy Hamilton on *Zymurgy*, (10/09/06), and internationally-known paleontologist Dr. Donald Johanson on *Lucy* (9/21/06). It is the very nature of the applicability of these contributions that gives *Science to Serve* its distinctiveness among the broader university community. In addition, the *Science to Serve* concept has gathered momentum over the past 5 years as demonstrated by the diversity of the relationships beyond the campus as aforementioned and expressed by the following testimonial:

"I think that what is unique and distinctive about the science education program at GCSU is the hands-on, real science that you apply to the local environments. Your approach engages so many other resources beyond the college such as Lockerly Arboretum and the school districts and you do not dilute the science but have kept it pure by finding more ways for people to understand. You have found new ways to apply the science to the general community. Your programs use a diverse body students, faculty and industry/business professionals that support the. I think that GCSU has continued a strong legacy of establishing partnerships to make the science work for all." --Dr. Mike Walker, Executive Director, Oconee RESA

In recognition of the outstanding achievements in science education, Georgia senator Johnny Grant has offered to obtain a resolution to commend the *Science to Serve* framework for its accomplishments to date.

Sustainability

Enrollment of students in science courses has been fueled, in part, by statewide mandates for what teachers and students need to know and be able to do at all P16 levels. At the K12 public schools, for example, statewide assessments begin during the 2007-08 academic year. Paralleling these assessments are accountability measures that place schools at risk for not meeting annual yearly progress (AYP). GCSU has witnessed a boost in the demand for pre-service and in-service teacher professional development in middle grades science since 2002 and plans are underway for area F science courses are being designed for elementary pre-service teachers.

Confounding this dilemma is the anticipated 10% percent retirement of scientists and science teachers within the next five years (National Science Foundation, 2006). Plus, the most recent forecast for 2002–12 indicate that employment in science and engineering occupations will increase about 70% faster than the

overall growth rate for all occupations (National Science Foundation, 2006). Enrollment levels are expected to remain elevated over the next two decades with increased student access to higher education opportunities.

More than 75% of the faculty members in the primary departments supporting the *Science to Serve* initiative consider themselves stakeholders and contribute significant amounts of time and expertise to projects. Most, if not all, are tenured. Faculty routinely encourage student participation in science outreach by awarding credit toward service-learning (ex. Science Fair) or do not schedule exams during professional conferences that students are attending (ex. Georgia Academy of Sciences). This level of commitment and systemic characteristics of faculty involvement points to a high likelihood of success. The 12-month positions held by the directors of the Science Education Center and Academic Outreach also underscores the university's support for the programs in place. In addition, the recently renovated science building and planned phase II addition to Herty Hall will elevate the visibility of the *Science to Serve* concept by providing the needed space for additional faculty and staff positions to support programs.

This proposal lists several initiatives/programs in place and it is anticipated that these will strengthen with deliberate efforts by all stakeholders. Science education has access to a plethora of external funding possibilities including federal agencies, such as the National Science Foundation's Informal Science Education program (National Science Foundation, 2007) and the U.S. Department of Education, and foundations that promote science literacy, such as the Keck Foundation.

The *Science to Serve* framework will provide a cohesive, coherent and comprehensive structure that will greatly enhance opportunities for acquiring external support. If selected as one of GCSU's programs of distinction, this will further elevate the opportunity for funding from these organizations. The proposed framework at GCSU will preserve the heritage of GCSU whose mission has always been to use practical ways to improve the world while at the same time shifting the common notion of science allowing us to highlight the way in which science *is* civic engagement.

References

- Chemistry grads post gains in 2005. Chemical & Engineering News, July 24, 2006. 30 Jan. 2007. <<http://pubs.acs.org/cen/acsnews/84/8430cpt05.html>>
- Council of Liberal Arts Colleges & Universities. 25 Oct. 2005. COPLAC. 10 Jan. 2007. <<http://www.coplac.org>>
- Maurrasede, David. *Beyond the Campus: How colleges and universities form partnerships with their communities*. New York: Routledge, 2001
- National Research Council: The *National Science Education Standards*. Washington, DC: National Academic Press, 1996.
- National Science Board & National Science Foundation. (2002). *Science and engineering indicators*. Arlington, VA: Author.
- Informal Science Education. 6 Feb. 2007. National Science Foundation. 13 Feb. 2007. <http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf06520>
- Pope, Lauren. *Colleges that change lives: 40 schools you should know about even if you're not a straight-A student*. New York: Penguin Books, 2000.
- Science and Engineering Indicators 2006. 23 Feb. 2006. National Science Board. 18 Jan. 2007 <<http://www.nsf.gov/statistics/seind06/c3/c3s1.htm#c3s113>>
- Science Education for New Civic Engagements and Responsibilities. SENCER. 15 Jan. 2007 <<http://www.sencer.net>>

The Governor's Office of Student Achievement. 2005-2006 Georgia Professional Standards Commission Annual Report Card. Praxis II Exams by Specific Content Pass Rates for All Examinees 2005-2006. 30 Jan. 2007 <<http://reportcard2006.gaosa.org/psc/reports.asp?TestKey=alltests>>

U.S. News & World Report: America's Best Colleges 2005. 13 Jan. 2007.
<http://www.usnews.com/usnews/edu/college/rankings/rankindex_brief.php>