Connecting Campus Resources to Help Liberal Arts STEM Majors Articulate Competencies/Skills Valued in the Workplace

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Good teaching joins self and subjects and students and guides us on an inner journey toward more truthful ways of seeing and being.

- Anonymous
**Chavonda J. Mills** is Interim Associate Dean, College of Arts & Sciences and Professor of Chemistry at Georgia College, Milledgeville, GA. She holds a B.S. in Chemistry from Spelman College, B.S. in Chemical Engineering from the Georgia Institute of Technology, and Ph.D. in Medicinal Chemistry from Florida A&M University.

As Interim Associate Dean, Mills leads the college’s efforts to recruit and hire exceptional and diverse faculty, recruit students from communities under-represented at Georgia College, and propose new academic programs. Mills has been recognized as an emerging leader in higher education as evidenced by her selection to attend numerous leadership programs including the American Association of State Colleges & Universities Emerging Leaders Program, ACE Advancing to the CAO Program, and HERS Summer Institute for Women in Higher Education.

A champion for enhancement of science curricula, Mills is the recipient of NSF grants focused on science curriculum development and reform. Her most recent activities focus on addressing science education and underrepresentation of minorities in science. She holds a patent in the development of synthetic flavonoids as methods of treatment of HIV infection and other pathologies and has published in the areas of medicinal chemistry and science education. Mills is an active member of numerous professional organizations, serves as an American Chemical Society Expert and was recently selected as an inaugural board member for the Baldwin Charter System Foundation of Excellence. chavonda.mills@gc.edu • 478-445-4441

**Rosalie A. Richards** is Associate Provost for Faculty Development and Professor of Chemistry and Education at Stetson University. She earned a B.S. in chemistry with physics from the University of the Virgin Islands, a Ph.D. in chemistry from the University of Southern California, and a certificate in project management from Keller Graduate School of Management.

A porphyrin chemist, Rosalie serves frequently as an institute facilitator for the Council on Undergraduate Research and is currently a consultant for the NSF-supported CUR Transformations Project. Rosalie is also co-developer of the 2018 Oxford University Press online course “Integrating Undergraduate Research Across the Curriculum” in the Research as a Transferable Skill program. Rosalie has published articles on strategies for engaging students in the classroom, the use of collaborative cases for teaching organic chemistry, and faculty approaches to undergraduate research. As former Associate Vice President for Academic Affairs and Associate Dean of the College at ASC, she had roles in assessment of student learning outcomes for majors and Summit general education courses, faculty development, and college-wide mentored research support for students. Her recent activities include serving on the Advisory Board for Project Kaleidoscope (PKAL), AAC&U’s STEM higher education reform center. lharvey@agnesscott.edu • 404-471-6272

**Lilia C. Harvey** is Associate Dean for STEM Teaching and Learning, Professor of Chemistry, and Faculty Director of the Science Center for Women (SCW) at Agnes Scott College. She has a B.S. in Chemistry from Florida International University and a Ph.D. in Chemistry from the Georgia Institute of Technology.

As Faculty Director of the SCW, Harvey coordinates STEM co-curricular programs that have demonstrated a four-year trend of improved student persistence and success in STEM through the use of evidence-based best practices such as supplemental instruction (SI) with peer-to-peer support, mentored research experience, living-learning communities, intensive advising, and fostering inclusive community.

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**Dawn Killenberg** is the Director of the Office of Internship and Career Development at Agnes Scott College. Dawn earned her MBA at the University of North Carolina at Chapel Hill and held roles in social trends, research and marketing consulting. Dawn worked with dozens of Fortune 500 organizations in addition to local and national nonprofits. Dawn completed her certification in Academic Advising at Kansas State University before transitioning to higher education.

The Office of Internship and Career Development is part of the Division of Academic Affairs at ASC, and Dawn’s team works closely with faculty to support students across all majors with career coaching, internship guidance and alumnae connections. Building ‘Career Literacy’ is central to helping students identify their best opportunities for careers post-ASC via information interviews, career panels, and alumnae connections. The SUMMIT Career Connect is a network of 400+ ASC alumnae who have agreed to support students on their professional journeys with practice interviews, professional conversations and workplace visits.

Dawn’s team has also collaborated with academic departments to develop tools that help students identify and articulate the transferrable skills gained via liberal arts coursework, as well as, via internships, mentored research, study abroad and campus/community leadership experiences. Last year, student engagement with the Office of Internship and Career Development reached a 5-year high, and 70% of graduating seniors reported completing at least one internship while at ASC. dkillenberg@agnesscott.edu • 404-471-5562

**B I O G R A P H I E S**
Georgia College & State University is a member institution of the University System of Georgia and is the state’s designated public liberal arts university. As a member of the Council of Public Liberal Arts Colleges (COPLAC), Georgia College serves approximately 7,000 undergraduate and graduate students in four colleges – the College of Arts and Sciences, the J. Whitney Bunting College of Business, the John H. Lounsbury College of Education, and the College of Health Sciences – with more than 330 faculty and almost 1,000 full-time staff. The College of Arts and Sciences is at the core of the liberal arts institution and houses four of the five STEM departments at the university; these include: Biological & Environmental Sciences, Chemistry, Physics, & Astronomy, Mathematics, and Psychological Science. STEM degree seeking majors comprise 39.1% of students enrolled in the College, and four STEM programs are within the top 20 majors at the university: Biology, Psychology, Physics, and Environmental Sciences.

The University has a total student population in 2018-19 is 4,268 with over 1,000 students matriculating through graduate programs in business, counselor education, and law. The majority of students hail from the state of Florida with a growing international student population (6.5%). Over two-thirds of students reside in university or affiliated housing. Stetson University offers many majors with small class sizes (13:1 student-to-faculty) and 60% classes with fewer than 20 students. The $18 million investment is part of the Beyond Success – Significance fundraising campaign.

A decade ago, Stetson University embarked on an ambitious plan to boost science in the Central Florida region through increased student enrollment and a concomitant expansion of its tenure-track STEM faculty corps. The university re-envisioned its geography and environmental science program as environmental science and studies, created a health sciences program, and added a public health minor to already thriving chemistry, biology, physics, and math/computer science majors. This past spring, Hyatt and Cici Brown donated the largest gift in Stetson’s history to broaden science and health education footprint in Central Florida. The DeLand campus, located halfway between Daytona Beach and Orlando, is on the National Register of Historic Places, and Stetson University gave Florida its first law, music and business schools. Since its founding in 1900 as Florida’s first law school, the College of Law is internationally renowned for preparing highly skilled and ethical lawyers and leaders, most of whom preside over legal matters in the state. The law campus is located in Gulfport and graduate programs are offered at the Celebration Center.

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Georgia College has been consistently recognized by US News & World Report as one of the “Top Public Schools in the South” and is ranked #5 in Best Undergraduate Teaching Programs (Regional) and by Kiplinger for “Best College Value.” 

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Agnes Scott College is an independent national liberal arts college for women founded in 1889, located in metropolitan Atlanta. Agnes Scott’s mission is to educate students to think deeply, live honorably, and engage the intellectual and social challenges of their times. The college’s signature experience, SUMMIT, launched in 2015, has reimagined the traditional liberal arts education by integrating global learning and leadership development throughout the curriculum and aims to “[prepare] every student to be an effective agent of change in a global society” by developing leadership abilities and understanding of complex global dynamics. Agnes Scott is ranked No. 1 as the most innovative college and No. 2 for Best Undergraduate Teaching by U.S. News & World Report in its 2019 Best Colleges rankings. A new measure, Social Mobility, was utilized to rank whether colleges with a significant number of Pell-eligible students graduate those students at the same rate as non-Pell-eligible students. The 2019 U.S. News & World Report rankings ranked Agnes Scott College No. 1 in Social Mobility among national liberal arts colleges.

Agnes Scott is a minority-serving institution: 58% of the 976 undergraduates of the 2018 student body were underrepresented minorities and 41% were Pell-eligible. Overall, about 30% of students in an entering class cohort express an early interest in STEM, and 5-10% of entering students express interest in a non-STEM degree but later declare a major in STEM. 

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During this session, participants will

- Discuss ideas for connecting and leveraging existing resources to help students articulate the value of their STEM skills and experiences in a liberal arts context;
- Explore reflective practice as a strategy for students to connect curricular and co-curricular experiences to workplace skills; and
- Leverage expertise of those present to uncover institutional assets to help students to effectively synthesize their curricular and co-curricular experiences for postgraduate success.

Full Abstract

Skills and competencies resulting from a liberal arts education such as teamwork, effective communication, and critical thinking, are key to lifelong learning and career satisfaction (AAC&U, 2013), and highly valued by employers (NACE, 2016). Yet, there is often a chasm between what is taught and what students must demonstrate to successfully compete in the global marketplace. Mentoring, through high impact educational practices such as internships and research, provides a vital bridge between the traditional classroom and the preparation graduate schools and industry demand. The STEM disciplines offer ample opportunity for mentors to evaluate students’ levels of academic preparation but few are well equipped to help students effectively articulate the core competencies acquired or value-added to post-baccalaureate pursuits. To effect change, educators must intentionally design for the desired outcome. Unfortunately, mentoring with a career and professional development orientation remains a hidden pedagogy in undergraduate education.

To address this challenge, three liberal arts institutions located in the southeastern United States have engineered different approaches to help students connect their liberal arts STEM experiences and career readiness. At Georgia College & State University, Georgia’s public liberal arts university, science majors are expected to complete a set of benchmarks that follows a four-year career planning model. This is coupled with a mentored research requirement culminating with a capstone project where students critically reflect on their experience and its value to their future careers. At Agnes Scott College, a private liberal arts college for women in Atlanta, Georgia, participants in the STEM Scholars mentored research summer program build on leadership skills developed in the college’s SUMMIT program. Participants receive individual goal-directed advising, training in communicating science effectively, and career literacy and professional development programming from the Office of Internship and Career Development. At Stetson University, a private liberal arts university in Florida, the science programs have collaborated with the Office of Career & Professional Development to build a career culture that leverages the common learning experience - first-year seminar, junior seminar, and senior capstone.

During this interactive session, panelists will lead a discussion for participants to uncover their own institutional assets to help students to effectively synthesize their curricular and co-curricular experiences for postgraduate success.

Citations


Equip students to translate/articulate effectively the competencies acquired through participation in High-Impact Experiential Learning Practices and other curricula or co-curricular experiences.

**Context/Goals**

A key goal of the 2014-2019 Strategic Plan is to Strengthen Career Readiness & Graduate Success. Increasing student and faculty participation necessitated:

- examination of our Experiential Learning and High Impact Practices
- creating opportunities for student participation
- development of a Center for Career & Professional Development
- mapping of our curricular/co-curricular programs to our General Education learning outcomes

**Successes**

**Challenges & Opportunities**

- Need for more integrated assessment of learning outcomes including intentional alignment of curricular learning assessment with co-curricular assessment
- Creating coherence, scaffolding and integration of learning among three core academic learning requirements: first-year seminar, junior seminar and senior project (research/creative activity)
- Integration across student affairs co-curricular learning models – for example, competencies, T-shaped professional, social change model of leadership, strengths-based campus
- Ability of students to effectively articulate Gen Ed and program/major learning outcomes to competencies of their experiences, skills, and competencies?
## What Matters?

<table>
<thead>
<tr>
<th>Rank Top 3</th>
<th>You</th>
<th>Broadly Educated Student</th>
<th>Employee</th>
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<tbody>
<tr>
<td>Knowledge of Human Cultures</td>
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<td>Knowledge of the Physical and Natural World</td>
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<td>Critical Thinking</td>
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<td>Intercultural Knowledge and Competence</td>
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<td>Ethical Reasoning and Action</td>
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<td>Foundations and Skills for Lifelong Learning</td>
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Using Two High-Impact Practices, Internships and Mentored Research, to enhance student learning and develop skills and experiences critical to career and post-graduate success.

Context/goals
Our QEP goal to increase student and faculty participation in High Impact Practices also necessitated that we develop:

- standardized and rigorous academic components for credit bearing internships and mentored research
- Improved processes for participation and program implementation
- integrated assessment
- approaches to help students translate/communicate what they’ve learned in classes and labs to generalizable workplace skills

Strategies
- Major to career roadmaps
- Skills by major and experience
- Career literacy building (Career Treks, alumnae engagement)
- Faculty training workshops

Successes
- Increase in number of students completing internships and participating in undergraduate research
- Consistent, rigorous and well-defined processes for internships and mentored research participation
- Learning and career outcomes
- Student satisfaction survey
- Alumnae willingness to engage in Career Literacy initiatives via the SUMMIT Career Connect

Challenges & Opportunities
- Traditional mentored research/undergraduate research programs are geared towards preparing students for graduate school, but many of our students may not attend graduate school in a STEM discipline.
- Bridging communication gaps between outcomes and assessment language used by faculty and employability or skills language used or sought by employers.
Consider the tools shared in light of your campus goals and resources. Think about what might work for your campus in the short term (next 6 months). What do you like about the idea? What challenges need to be overcome to make the idea better for your campus? What ideas would you like to build on for longer term? Do these resources and tools spark other ideas for linking transferrable skills with majors and careers?
Context/Goals
Georgia College's Career Planning Milestones Program (see brochure) was launched in 2015 and offers students a four-year high-impact career-preparation program that begins their first semester on campus. This high-impact program offered by the Career Center goes beyond traditional services of resume writing, mock interviews, and career counseling as students are required to be “effortful, reflective, open to feedback, and engaged in regards to how they manage their careers.” Further, as the state’s designated liberal arts college, it is imperative that graduates can clearly articulate the skills and competencies resulting from a liberal arts education such as oral and written communication, ethical judgement and decision-making, critical/analytical thinking, and information literacy. Departments and faculty across campus have partnered with the Career Center to incorporate the Milestones into their curriculum so that career preparation and readiness becomes a priority for students.

The case study provided herein provides an example of how Georgia College’s Department of Chemistry, Physics, & Astronomy partnered with the Career Center to increase career readiness of their majors by helping them connect their curricular and co-curricular experiences to workplace skills.

Strategies
Table 1. Four-Year Seminar Series Assignments

<table>
<thead>
<tr>
<th>Seminar Course</th>
<th>Career Planning Milestone</th>
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<tbody>
<tr>
<td>First-Year, CHEM 0001</td>
<td>Exploration: introduction to the Career Center, GC Journeys, information literacy, portfolio software, Focus 2 assessment</td>
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<tr>
<td>Sophomore, CHEM 2920</td>
<td>Preparation: resume/CV, literature review, oral presentation, mentor first-year majors, peer-review lab reports</td>
</tr>
<tr>
<td>Junior, CHEM 3920</td>
<td>Planning: mock interview, literature review, oral presentation, create LinkedIn account, portfolio</td>
</tr>
<tr>
<td>Senior, CHEM 4920</td>
<td>Implementation: original research oral presentation, portfolio, reflection essay</td>
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</table>

The chemistry senior capstone course, CHEM 4920, provides the clearest evidence of how students demonstrate gains in connecting curriculum to career. In this course, students prepare a research presentation and a portfolio comprised of evidence of their progress in meeting SLOs/program goals. Students are provided a rubric and must identify works/evidence that satisfy/meet competencies. Deliberate developmental offerings at all levels of the program provide students multiple opportunities to refine their skills. For example, formal oral presentations are required in sophomore, junior, and senior-level seminar courses.

Table 2. Example Rubric for Senior Capstone, CHEM 4920

<table>
<thead>
<tr>
<th>Program Goal</th>
<th>Student Learning Outcomes</th>
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</thead>
</table>
| Communication Skills | Students will develop adequate skills in technical writing and oral presentations by:  
  i. Writing scientific publications in the chemical sciences  
  ii. presenting research at local, regional, or national conferences  
 Students will effectively communicate chemical information to chemists and general audiences by:  
  i. understanding and using chemical language, where appropriate  
  ii. articulating answers to questions using relevant chemical information |
| Professionalism | Students will develop the dispositions and skills of a professional in the field of chemistry by:  
  i. demonstrating professional skills and dispositions such as, application of chemical knowledge to civic and/or social problems, ethical decision-making, collaboration/ teamwork |
Successes

- Faculty incorporated professional and career-oriented competencies in the curriculum coupled with appropriate assessment
- Students are able to communicate non-content skills gained in the classroom
- Students are able to demonstrate their ability to connect assignments with workplace skills.
- Post-graduate placement, AY16-AY18 (n=49): 35% of chemistry alumni are working full-time in a chemistry related industry; 31% are pursuing graduate degrees (MS or PhD); 18% are pursuing medical and health professions doctorate degrees (MD, PharmD, DDS, etc.); and 16% are working full-time in a non-chemistry related field

Student Quotes

- "I have developed a large amount of problem solving skills...we were required to rely on our own research to develop our procedures in the biodiesel and aspirin labs."
- "[Undergraduate] research further developed my laboratory and chemical knowledge skills as this type of laboratory study is independent with the guidance of an advisor"
- "I developed the skill to look at issues in the context of the problem. In the laboratory, unpredictable results and observations could occur and they would have to be corrected."
- "Multiple courses had oral or poster presentation components. These presentations allowed me to be more comfortable in verbally conveying what I learned."
- "Multiple chemistry courses I took were the flipped classroom style. Self-discipline is important for this type of course because if you do not put forth the work you will not succeed so, you need to be self-motivated to do the course work."
- "By working in groups, I have strengthened my professionalism in various areas, including working with difficult partners, taking responsibility in a timely manner, and other factors that commonly arise in group work"

Challenges & Opportunities

- Chemistry program curriculum incorporates only 6 of the 15 recommended career development activities
- Students’ reflection upon their experiences occurs spring semester of senior year as opposed to being scaffolded over all four years
- No post-graduation survey of alumni regarding their ability to articulate competencies to potential employers
- No survey of employers regarding graduate’s ability to articulate competencies

<table>
<thead>
<tr>
<th>Academic Support Unit</th>
<th>Workplace Competency</th>
<th>Program Goal(s)</th>
<th>Possible Course and Course Outcome</th>
<th>Activities and Assessments</th>
<th>Student Reflection Assignments</th>
</tr>
</thead>
</table>

**MAPPING CURRICULUM TO CAREER COMPETENCIES**