



Georgia Gwinnett College, School of Science and Technology
 STEM Education Improvement Plan
Improving P-16 STEM Performance via High Student Engagement Strategies

Georgia Gwinnett College’s (GGC) STEM Education Improvement Plan (STEM EIP) seeks to build upon the successes of our STEM Initiative II Program and to incorporate new components of projects that show promising results in improving student performance, persistence and retention. GGC’s STEM EIP addresses all three goals of the USG STEM Initiative. Our Plan includes three key strategies:

1. Improve our 4-Year Undergraduate Research and Creative Experiences (4YrURCE) model, but with a newly focused effort on introductory STEM gateway courses (*USG Goal 2*).
2. Re-evaluate and redesign our Service Learning Internship Course so that it not only improves college readiness for P-12 students (*USG Goal 1*), but will also have an impact on preparing and supporting P-12 STEM teachers in Georgia’s classrooms (*USG Goal 3*).
3. Implement a Peer Supplemental Instruction (PSI) program that builds upon a pilot PSI/Peer mentoring project (funded through a CCG incubator grant). This strategy addresses *USG Goal 2*.

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1. Four-year Undergraduate Research and Creative Experience (4YrURCE) Program. A key strategy of GGC’s STEM Initiative II program was the development and implementation of a *4YrURCE Program*. This pilot project was developed by the School of Science and Technology (SST) and takes the idea of course-embedded

undergraduate research experiences (CUREs) one step further by creating a model that systematically scaffolds course-embedded research and creative experiences into *every* STEM major in *each* of the four years of their undergraduate matriculation. The definition of “research experiences” has been well debated, but for our purposes we wanted students to develop research skills and competencies through high quality research experiences that are novel to them. We include the term “creative experiences” for disciplines such as Information Technology that engage in creative activities rather than research activities (for example, the creation of apps, games, animations, etc.). As students progress through the *4YrURCE*, they receive repeated exposure to the process of the scientific method/design process through inquiry and research/creativity, gradually develop and build problem-solving and critical thinking skills, build confidence for faculty-mentored research experiences, and by the time they graduate will have acquired various STEM Competencies (skills and content) that are applicable to all careers. Our *4YrURCE* model (Figure 1) provides scaffolding of research and creative experiences with increasing complexity from Freshman to Senior years.

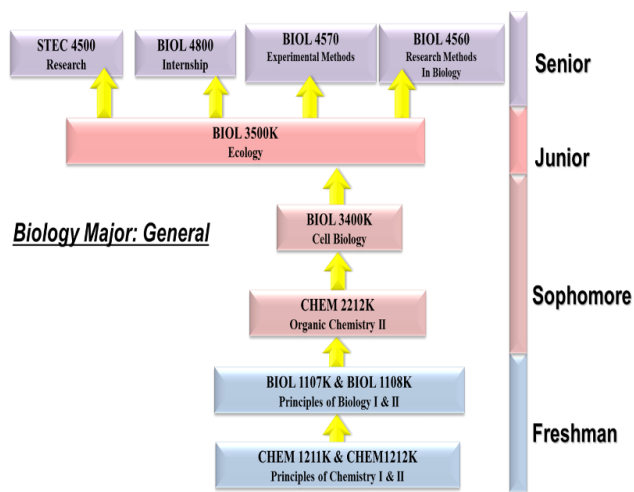


Figure 1: General Biology’s 4YrURCE Sequence

Specific objectives of the 4YrURCE strategy are:

1. Implement CURE’s in select STEM gateway courses through a GGC STEM Gateway Course Mini-Grant Program
2. Lower D/F/W rates in targeted gateway courses
3. Implement CURE’s in select STEM upper level courses on designated 4YrURCE tracks
4. Improve student attitudes about STEM and careers in STEM
5. Improve student skills and competencies in targeted course and year goals

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2. Service Learning Internship Course. A second key component of GGC’s STEM Initiative II program was the development of a Service Learning Internship course, designed to address the USG STEM Initiative goals of increasing the interest and preparation of K-12 students to STEM fields. Over the past five years, SST has partnered with McKendree Elementary to deliver a science curriculum enrichment program to McKendree 5th grade students through a 3–credit Service Learning Course (SLC). GGC interns, directed by faculty and program coordinators from SST, prepared and executed a program of hands-on lab activities with real-world science concept applications for the 5th grade students based on the project-based learning scenarios developed during the first two years of the project. While this project has proven to be successful, our SLC team would like to re-evaluate and redesign the Service Learning Course into a more sustainable model that can impact a greater group of teachers and students. This component of our STEM EIP is designed to improve college readiness for P-12 students (*USG Goal 1*), and will also have an impact on preparing and supporting P-12 STEM teachers in Georgia’s classroom (*USG Goal 3*).

Specific objectives of the new, redesigned Service Learning Internship course are:

- 1) Integrate our project-based curriculum into the 5th grade science curriculum.
- 2) Train teachers to implement the curriculum and have them train their peers (train-the-trainer model)
- 3) Expand the course to 5 elementary schools over the course of 3 years, and provide the schools with necessary supplies and consumables to conduct the project-based learning.
- 4) Provide GGC interns with “real world skills” and STEM Competencies necessary for a successful professional career in STEM-related areas of expertise.

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3. Peer Supplemental Instruction. The goal of this strategy is to create a sustainable Peer Supplemental Instruction (PSI) model for gateway STEM courses that are historically challenging and yield high DWF rates. ***PSI is a high impact strategy that will be developed to improve performance and retention in STEM core courses and majors (USG STEM Initiative Goal 2) in the School of Science & Technology at GGC.*** Numerous studies have shown that providing peer-assisted academic support has helped increase the mean final course grades and overall retention of participating students versus non-participants and that PSI is also effective in enhancing STEM education. The positive impact of PSI at our institution is evidenced by preliminary data compiled from a Complete College Georgia incubator grant that began in Fall 2015, which showed that PSI participation correlated with enhanced performance in exam and final course grades in BIOL 1107K and CHEM 1211K. Additionally, PSI leaders were embedded in BIOL 1107K laboratory sessions in order to help students in the acquisition of fundamental research skills that will be used in upper-level courses. The PSI Leaders also showed significant improvement on content assessment exams covering basic biology and chemistry concepts after serving for one semester and reported increased confidence in their current STEM courses.

Specific Objectives of the PSI program are to:

1. Improve final course grades in gateway STEM courses (BIOL 1107K/1108K, CHEM 1211K/1212K, MATH 1111/1113) and reduce D/F/W rates each semester.
2. Improve discipline-specific STEM competencies and lab skills.
3. Cultivate in PSI leaders strong leadership skills and confidence in STEM subjects.
4. Improve course content knowledge of PSI Leaders.

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