# Section 1. Cover Sheet

* Principal Investigator Name: Macris, Catherine
* Position title: Associate professor
* School: School of Science
* Department: Department of Earth and Environmental Sciences
* Project title: 1 5 Authentic Assessments through Place-Based Learning and Environmental Justice
* Amount requested (funds from CTL only): $xxx
* Co-Principal Investigators (Name, Title, School, Department, Email):
* Name: Anna Jessee
Title: Lecturer
Email: manowick@iu.edu
School: School of Science
Department: Department of Earth and Environmental Sciences
Other Key Personnel (Name, Title, School, Department, Email):
None
* Description of courses or curriculum involved in the project, including enrollment figures in the past three years.
G205: Reporting Skills in Geoscience is a required course for all EES majors teaching them skills in scientific writing and oral presentation. It is taught in both fall and spring semesters. Fall 2023 - 17 students Spring 2023 - 17 students Fall 2022 - 22 students Spring 2022 - not offered Fall 2021 - 15 students Spring 2021 - 23 students
* Does this proposal focus on integrating ePortfolios within a course, multiple courses, or a program? No

# Section 2. Abstract (250 words maximum)

The goal of this project is to redesign the Earth and Environmental Sciences (EES) course, G205: Reporting Skills in Geoscience, to increase student learning outcomes, self-efficacy, sense of belonging, and disciplinary identity. G205 is a required course for all EES majors that provides training in scientific writing and oral communication as students research geoscience related topics. The proposed intervention will incorporate place-based learning, authentic assessments, and environmental justice into the course, while still achieving existing course learning objectives regarding scientific communication skill building. The semester will be divided into two large projects. In both projects, students will research local brownfields through publicly available government documents and the scientific literature. Brownfields are abandoned/underutilized parcels of land that were polluted from industrial use and are often near homes of marginalized communities. For Project 1, students will write a technical report and give a presentation about it to a hypothetical ‘client’. For Project 2, students will create a community report and give a town hall style presentation.

# Section 3. Rationale and Literature Review (250 words maximum)

**What course or curriculum enhancement are you proposing? Why is this enhancement needed? What do you expect to change – in terms of your students’ learning, your program, and your teaching practice?**

G205 provides training in scientific communication on geoscience-related topics. Currently, the course requires students to analyze scientific research articles from geoscience journals as the only type of source. Students suffer from low self-efficacy, low sense of belonging, and lack of motivation as a result of this design. The research articles are difficult to comprehend, leaving these relatively new undergraduates feeling like maybe they do not belong in the course or the field if they do not understand the articles. This proposal would expand the scope of research and types of sources to be more accessible. Projects will incorporate authentic assessments, environmental justice, and community building, while still achieving existing learning objectives regarding scientific communication skills.

Students will research local brownfields by reading and analyzing public documents as well as relevant scientific literature. Brownfields are abandoned/underutilized parcels of land that were polluted from industrial use. Students will present their research in writing and orally to two different audiences. Assignments will include a technical report and presentation to a hypothetical ‘client’ and a community report and town hall-style presentation reporting environmental justice issues related to the site.

**Synthesize relevant literature with citations that support the proposed enhancement and intended outcomes in the same way you address existing knowledge in any research project in your discipline. Stress recent and comprehensive literature.**

The pedagogical intervention will require students to consider social inequities regarding the brownfields they research. They will use an environmental justice screening and mapping tool to assess which communities are affected by the environmental issue that created the brownfield. Incorporating environmental justice will allow students to engage with collectivistic and communal values, which have been shown to be more important for motivation and retention in underrepresented groups (Diekman et al., 2010; Carter et al., 2021). Recent work supports highlighting altruism and incorporating social good through environmental justice in geosciences as an effective strategy for recruiting and retaining more diverse students (Estrada et al., 2016; McGee & Bentley, 2017; Carter et al., 2021; Beckett et al., 2022).

These projects are examples of authentic learning experiences, which can be defined as challenging tasks that closely resemble those of the workplace settings (Sokhanvar et al., 2021), or more broadly, as tasks with social value or value directly to the student (McArther, 2023). Authentic assessments based around ideas of diversity and inclusion can help students develop a stronger sense of belonging, positive STEM identities, and improved student learning experiences (Singer et al., 2020).

# Section 4: Project Description (1000 words maximum)

**State measurable project goals that will help you realize the course/curriculum enhancement.**

1. Increase students’ sense of belonging and disciplinary identity through place-based, environmental justice projects.
2. Increase student learning outcomes, motivation, and self-efficacy by providing more engaging, accessible, and authentic assessments.

**Describe specific activities that you will engage in to achieve each of your project goals (700 words)**

**Project Goal #1:** Increase student learning outcomes, motivation, and self-eﬃcacy by providing more engaging, accessible, and authentic assessments.

Same activities as for project goal 2. See below.

**Project Goal #2:** Increase students’ sense of belonging and disciplinary identity through place-based, environmental justice projects.

We will redesign the G205 curriculum to consist of two large-scale projects with scaffolded, smaller assignments. The Indiana Brownﬁelds Projects will be authentic assessments designed to incorporate place-based learning and environmental justice. Curricular materials including homework assignments, in-class activities, slide decks, project descriptions, rubrics, and a Canvas page will be created for this unit. The project will be designed to engage students in research on Indiana brownﬁelds using primary literature including government reports, databases, news, and journal articles. We will consult with a local environmental project manager to ensure that this project is as authentic as possible.

**Describe a plan for sustainability of the curriculum enhancement beyond CEG project timeline, including references to ongoing professional development, assessment, partnerships, and growth.**

This curricular intervention will be designed, created, and implemented as part of this CEG project to test if it is successful at achieving the project goals. We will continue implementing the curriculum in future semesters if the data indicate positive student outcomes. Lessons that we learn from this project will be incorporated into improvements for future iterations of the curriculum.

# Section 5. Evaluation/Assessment Plan (500 words maximum)

**What would success look like in this project?**

Success of this project would be indicated by measurable increases in student learning outcomes, motivation, self-efficacy, sense of belonging, and disciplinary identity.

**What metrics will you use to determine the extent to which your project goals were achieved?**

**Goal:**  Increase student learning outcomes, motivation, and self-efficacy by providing more engaging, accessible, and authentic assessments.

* **Evaluation/Assessment:** Student learning outcomes will be measured by comparing student grades in the semester that the innovation is implemented with the control group’s grades. Students’ self-efficacy will be measured using the Leibowitz (2020) survey. Students’ motivation will be measured through the student reflections described above.
* **Analysis Method:** Quantitative (survey) data will be analyzed for statistically significant differences in pre- and post-survey responses for each group (control and experiment) and for differences between groups. Qualitative data will be coded and organized thematically, then treated using both grounded theory and content analysis approaches.

**Goal:** Increase students’ sense of belonging and disciplinary identity through place-based, environmental justice projects.

* **Evaluation/Assessment:** To measure sense of belonging and disciplinary identity, we will use a mixed methods approach. A pre- and post-survey instrument modified from Leibowitz et al. (2020) will be administered to G025 students in the Fall and Spring. The 28-item survey includes items from previously validated instruments to measure three constructs: academic engagement; self-efficacy; and sense of belonging to the academic major, institution, and residential community. The Fall group of students will be the control, as they will not experience the redesigned curriculum, while the Spring students will be the experimental group, as they will experience the intervention. The qualitative aspect of this approach will use student artifacts. Specifically, we will assign reflection activities for the experimental group with prompts designed to assess this goal.
* **Analysis Method:** Quantitative (survey) data will be analyzed for statistically significant differences in pre- and post-survey responses for each group (control and experiment) and for differences between groups. Qualitative data will be coded and organized thematically, then treated using both grounded theory and content analysis approaches.

# Section 6. Dissemination Plan (250 words maximum)

The curricular innovation will be published on the Science Education Resource Center (SERC) site hosted by Carleton College. If IRB approval is granted, the data will be disseminated through a research article in an education research journal and at conferences such as the Earth Educators Rendezvous and the Plater-Moore Conference.

# Section 7. Project Timeline (250 words maximum)

* The project will start in May 2024 and end in June 2025.
* In summer 2024, Macris and Jessee will design the new curriculum, including all assignments, slides, project descriptions, Canvas page, etc., as well as prepare the survey. They will consult with the environmental project manager intermittently as needed throughout this process. In Fall 2024, Jessee will administer the survey to the control group of students and implement the existing curriculum. In Spring 2025, Macris will administer the survey to the experimental group of students and implement the redesigned curriculum. In summer 2025, Macris and Jessee will analyze the data and disseminate the intervention and results.
* If Macris, Jessee, or the consultant are unavailable for some times during the summer, the group will work to plan a schedule that takes everyone’s obligations into account.

# Section 8. Budget and Justification

* We request $xxxx total for faculty summer salaries; 2 weeks for Macris and 1.5 weeks for Jessee. The total includes fringe for both. $xxx of that is requested from the grant and $xxx will be matched by the department. Macris will take the lead on developing the new projects, planning the schedule, and creating the materials.  She will also implement the intervention in the spring course and administer the survey. Jessee will co-design with Macris and administer the survey in the fall class. The funds requested are the time it will take to design and create this new curriculum.
* Funds are requested in the amount of $xxx from the grant to pay for 2-3 hours of consultation time with an environmental manager.

**Section 10. Results of Previous CEG Funding**

No previous funding.