

From: [Campus Climate Proposal form](#)
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Subject: New submission from Campus Climate Proposals
Date: Thursday, April 21, 2016 5:09:22 PM

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Physics Learning Center

What is your affiliation with UW-Madison? For group submissions, please respond for main contact.

- Academic Staff

Describe the concept. If already in use here or elsewhere, please indicate this.

Students from historically underrepresented racial/ethnic groups, female students, first-generation college students, returning adult students, and students from lower-income circumstances continue to be underrepresented in science, technology, engineering, and mathematics (STEM) majors. This challenge has been recognized by the University of Wisconsin, the National Science Foundation, and the National Academy of Sciences.

This proposal seeks support for a half-time staff position in the Physics Learning Center to sustain and expand our pilot supplemental instruction program to create a supportive learning community for students taking Physics in the Arts (Physics 109). This position would sustain our current supplemental instruction program offered in the Fall for students in the First Wave program taking Physics in the Arts as part of their First Year Interest Group of courses (~12-15 students) and expand the number of students who could participate. Additionally, it would offer the opportunity for students to participate in the Spring as well as in the Fall semester (~30-40 students each semester). We are also requesting support for three undergraduate Peer Mentor Tutors to work with the course each semester.

The Physics in the Arts course includes topics of sound and light traditionally taught in introductory physics courses and applies them to music, photography, and color mixing. This course is taken mainly by non-science majors to fulfill Quantitative B and Physical Science requirements in the College of Letters and Sciences. It is a popular course with enrollments of ~250 students every semester. The course offers the opportunity for students in non-STEM majors to gain scientific literacy and increase their confidence with math and science.

The exciting interdisciplinary nature of the Physics in the Arts course also makes it a particularly difficult course for students to find tutoring support through other campus resources because of its specialized content. Physics majors, including graduate students, typically have not studied a large portion of the curriculum (e.g., color mixing, musical scales, photography). Additionally, students who have taken the course often do not have the depth of physics training needed to explain some of the most challenging concepts (e.g., frequency, resonance, and virtual images from lenses) to other students.

The Physics Learning Center began a pilot supplemental instruction program in Fall 2011 for Physics in the Arts for First Wave students who take this course as part of their first semester First-Year Interest Group (FIG) trio of courses. Additional students from other campus diversity programs have also

participated. We currently assist 12-15 students each Fall. Every year a number of these students express high anxiety about the course and tell us that they "are not math and science people." We offer encouragement and promote a growth mindset. Many improve throughout the semester and each year there are students from the previous cohort who are excited to serve as Peer Mentor Tutors for the incoming cohort. These students become role models for the incoming students and gain confidence in their own math and science abilities.

How would this affect cultural change on campus?

A dedicated staff member to run the Physics Learning Center's Physics in the Arts supplemental instruction program would provide stability for our current program for First Wave students taking this course in their first semester as part of their First Year Interest Group of courses and would expand the program to include additional students. The Physics Learning Center's pilot program is offered only during the Fall semester and the additional staffing would enable us to offer supplemental instruction for students taking the course during either the Fall or Spring semester. The Physics Learning Center's Physics in the Arts program provides a supportive learning environment to assist students in learning physics, developing a growth mindset about STEM fields, and learning to effectively collaborate with other students in group work.

For new ideas, how would you propose piloting this idea to see if it would work? If the idea is already in use at UW-Madison, how would you propose expanding or altering this program for greater impact?

With funding from the Office of the Vice Provost for Diversity and Climate and the Madison Initiative for Undergraduates (MIU) program, the Physics Learning Center began a pilot supplemental instruction program in Fall 2011 for Physics in the Arts for First Wave students who take this course as part of their first semester First-Year Interest Group (FIG) trio of courses. Additional students from other diversity programs have also participated. As is the case with our program for introductory physics, the Physics in the Arts supplemental instruction group tutoring program stresses conceptual understanding and problem-solving skills. Students work together on homework problems and supplemental problems. We encourage the students to explain problems to each other. Each year, 12-14 First Wave students participate in our program; the majority of these students are from historically underrepresented racial/ethnic groups. Two or three students from the previous year's First Wave cohort work as Peer Mentor Tutors, along with previous teaching assistants for the course. The First Wave tutors serve as role models for the subsequent cohort and strengthen their own science and math skills, while gaining teaching experience.

Students, course faculty, and staff in our partner programs (Center for Academic Excellence; Division of Diversity, Equity, and Educational Achievement) have also requested services for Physics in the Arts. We include additional students, as their schedules permit, in our supplemental instruction sessions for this course. Each Fall, we typically have several students from other diversity programs who join these sessions.

We propose to expand the number of times that we offer supplemental instruction for Physics in the Arts so additional students can participate. A central goal of the Physics Learning Center is to address achievement/equity gaps (e.g. race, gender, socio-economic status, disability, age, transfer status, etc.). Participants in our program include people from historically underrepresented racial/ethnic groups, returning adults, students in lower-income circumstances, students in the first generation of their family to attend college, transfer students, and people with disabilities, all of whom might feel isolated in their large introductory course and thus have a more difficult time finding study partners. We also work with students experiencing academic difficulty due to factors such as weak math background.

The undergraduate Peer Mentor Tutors working with the Physics in the Arts course receive extensive training and supervision for their roles. During the Physics in the Arts tutoring sessions, the Peer Tutors are paired with previous teaching assistants for the course. The former teaching assistants know the course content and structure well. The Peer Mentor Tutors serve as role models. Additionally, the Peer Mentor Tutors working with us have had more experience with applications such as music mixing than do Physics Learning Center staff and graduate students and can thereby more readily relate the topics addressed in the course to topics of interest of the students. The proposed staff member would work closely with the undergraduate Peer Mentor Tutors, both to train them and to co-facilitate supplemental instruction sessions.

Being a Peer Mentor Tutor is a high-impact experience that involves extensive teacher training. The

tutors working with the Physics in the Arts course join the Peer Mentor Tutors working with other introductory physics courses at the weekly Physics Learning Center teaching seminar. Here we discuss topics such as creating a comfortable learning environment, strategies for promoting active learning amongst participants, fostering a growth mindset, group dynamics, helping students to prepare for exams, and gaining awareness of student experiences across many dimensions of diversity. The training sessions typically include a writing reflection followed by discussion. The syllabus also includes guest speakers who have knowledge on topics from stereotype threat to assessment of learning. Additionally, the tutors participate in a four-hour orientation training session prior to the start of the academic year. The tutors also attend a second weekly training meeting to discuss specific strategies for teaching the content of the coming week. In this meeting the Physics in the Arts tutors do the weekly homework assignment, identify possible misconceptions, reflect on the previous session, and create a teaching plan for the coming session.

As is the case for our core introductory physics program, the Physics Learning Center tracks student performance for our Physics in the Arts supplemental instruction program. We record student attendance and reach out to those who have missed sessions. In addition, we monitor student grades on midterm and final exams. We have students fill out intake surveys so that Physics Learning Center staff can know more about student experience and needs. Additionally, we give participants in our Physics in the Arts program a survey at the end of the semester to provide feedback to guide our program offering and development.

The Physics Learning Center's pilot supplemental instruction program for Physics in the Arts has had encouraging results with all student participants completing the course with a "C" or better and almost all earning a grade of "BC" or better and many earning higher grades. The students and Peer Tutors indicate appreciation for the program as evidenced by their comments on surveys, some of which are included below.

Comments from student participants in the Physics Learning Center pilot program for Physics in the Arts:

- [REDACTED]

Comments from undergraduate Peer Mentor Tutors for Physics in the Arts:

- [REDACTED]

The Physics Learning Center's programming addresses the University of Wisconsin's Essential Learning Outcomes (<http://provost.wisc.edu/assessment/>). Our programs are designed to increase knowledge of the natural and physical world for both student participants and Peer Mentor Tutors as well as to develop the intellectual and practical skills of teamwork and problem solving. In addition, working as a Peer Mentor Tutor is considered to be a high impact activity and helps students to develop personal and social responsibility both through the experience of facilitating a learning team and through the content of our Peer Mentor Tutor teaching seminar.

We propose creating stability for our existing Fall pilot supplemental instruction program for Physics in the Arts and expanding to offer supplemental instruction opportunities to additional students in both the Fall and Spring semesters by hiring a 0.50 FTE staff member in the Physics Learning Center. This staff member would invite and interview student participants, train the undergraduate Peer Mentor Tutors, co-lead supplemental instruction sessions with the Peer Mentor Tutors, attend lectures, and coordinate with the professors and teaching assistants teaching the Physics in the Arts course.

What resources would be needed to implement your suggestion?

We are requesting a 0.50 FTE position (~\$23,000) and funding for three undergraduate Peer Mentor Tutors for the academic year (\$8,000) for a total cost of ~\$31,000.

Please use this space for any additional information about your proposal that you wish to share:

Students, course faculty, and staff in our partner programs (First Wave; Center for Academic Excellence; Division of Diversity, Equity, and Educational Achievement) have requested services for Physics in the Arts. A dedicated staff member would enable the Physics Learning Center to provide a supportive, inclusive learning environment for a larger group of students taking the Physics in the Arts course, as well as training, teaching, and leadership experience for our undergraduate Peer Mentor Tutors.