

Project Name: *Learning and Discovery in Experimental Environmental Health Science: On the Path from Data to Knowledge*

Authors, Affiliations, and Email Address of Primary Contact:

David Petering, University of Wisconsin-Milwaukee (petering@uwm.edu); Craig Berg, University of Wisconsin-Milwaukee; Michael Carvan, University of Wisconsin-Milwaukee; Renee Hesselbach, University of Wisconsin-Milwaukee

Funder:

SEPA - NIGMS

Website:

<https://sites.uwm.edu/winstep/>

If SEPA project, URL for project on <https://nihsepa.org/>

<https://nihsepa.org/institution/university-of-wisconsin-milwaukee/>

Brief Program Description (50 – 60 words)

The UW-Milwaukee SEPA program offers diverse middle and high school students opportunities to conduct a full range of scientific activities from research to scientific communication in relation to environmental chemical safety. We deliver the program in collaboration with in-service and early career teachers graduating from our pre-service teacher program, and experienced mentor teachers. The novel theme running through our program is *data*, through the lens of introductory data science and a fully developed “big” data portal.

Program and Participant Characteristics

Program type (Please check all that apply):
 Curriculum. Out-of-school program
 Exhibit Interactive multimedia
 Teacher PD
 Research experiences for students or teachers
 Other (describe):

Setting(s): Formal Informal

Types of participants
 Students Teachers Scientists
 Families Public
 Other (describe):

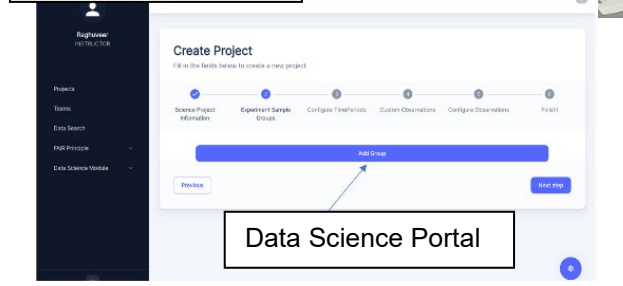
Grade level(s) of participants
 PreK Elementary (K-5) Middle (6-8)
 High (9-12) Adult

Characteristics of the populations you serve relative to DEIA: Middle/high school age students, and those of all races, ethnicities, abilities, disabilities, genders, religions, cultures, and sexual orientations.



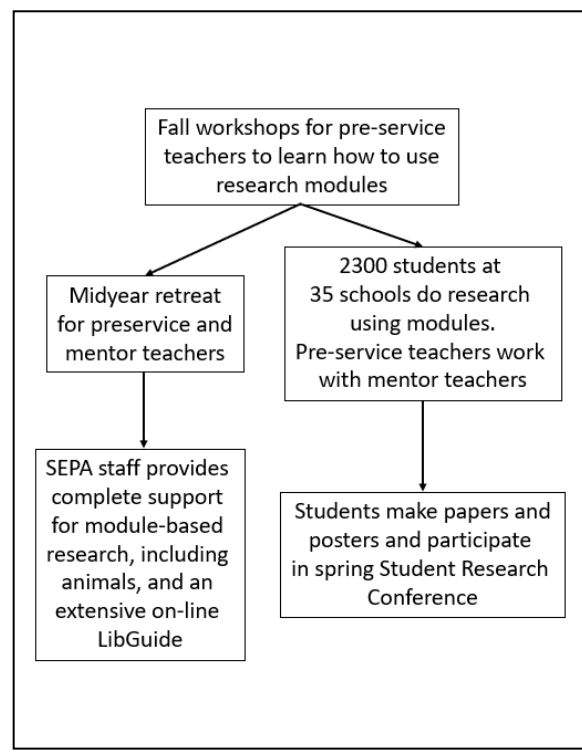
Student Research conference

Pre-Service Teacher Workshop: Earthworm module: impact of chemicals on neuromuscular behavior



Data Science Portal

2023-24 Program Activities



Evaluation	Key Accomplishments and/or Findings
<p>Constructs measured</p> <p><input checked="" type="checkbox"/> Content knowledge <input type="checkbox"/> Skills</p> <p><input checked="" type="checkbox"/> Nature of science <input type="checkbox"/> Career awareness</p> <p><input checked="" type="checkbox"/> Attitudes (e.g., interest, identity, belonging)</p> <p><input type="checkbox"/> Quality or fidelity of implementation</p> <p><input type="checkbox"/> Other (describe):</p>	<p style="text-align: center;">Accomplishments</p> <ul style="list-style-type: none"> • On April 16, 2024, we sponsored our annual Student Research Conference. Over 500 students from 15 middle and high schools attended the event at UWM. Students presented 156 posters. Four research papers were also presented. • This year, our novel data science portal was developed and beta tested. It facilitates the collaborative creation, execution, and analysis of research projects, as well as exploration of “big” data aggregated from such projects. • We completed essays for students on the <u>scientific method</u> and on <u>environmental health civics</u>, focusing on the history of U.S. air and water pollution and its regulation. • We are partnering with UW-Stevens Point faculty and staff to expand our program to underrepresented students in rural north-central Wisconsin.
<p>Methods</p> <p><input checked="" type="checkbox"/> Tests/surveys <input checked="" type="checkbox"/> Interviews/focus groups</p> <p><input checked="" type="checkbox"/> Observations <input checked="" type="checkbox"/> Artifacts (e.g., student work)</p> <p><input type="checkbox"/> Other (describe):</p>	
<p>Design characteristics</p> <p><input type="checkbox"/> Comparison or control group</p> <p><input checked="" type="checkbox"/> Pre/post surveys or assessments</p> <p><input type="checkbox"/> Longitudinal tracking of participants</p> <p><input type="checkbox"/> Other (describe):</p>	
<p style="text-align: center;">Project Lessons Learned</p> <ul style="list-style-type: none"> • Students across the range of abilities and interests tune in to doing hands-on, open-ended research in our program. • A year-long research course based on the SEPA modules engages inner city, educationally disadvantaged students. • The program is an effective way to help pre-service science education students learn how to incorporate inquiry into their coursework. • The existing program structure has provided a fruitful framework for developing new educational initiatives, such as our data science portal. • A strong External Advisory Committee offers our program fresh insightful criticism and new ideas. 	<p style="text-align: center;">Evaluation Findings</p> <ul style="list-style-type: none"> • Pre-service teachers rated the workshops on a typical 4.0 grading scale. The earthworm workshop received a “GPA” of 3.60 and the zebrafish module training received a “GPA” of 3.20. • 100% of pre-service teachers reported the earthworm and zebrafish workshops increased their knowledge and understanding of the topics “a great deal”. • More than 80% of pre-service teachers stated content from the winter retreat increased their knowledge and understanding of the topics presented. 100% of pre-service teachers thought the content from the retreat sessions would be useful teaching tools. • 100% of teacher respondents “strongly agreed” that “the Student Research Conference was an important component of our SEPA program.” • 100% of mentor teachers rated the academic content of the zebrafish and earthworm modules as “very valuable”, and reported that the modules align “very well” with their science curriculum. • Based on matched pre-test/post-test results, there were statistically significant changes in students’ knowledge or opinions for: <ul style="list-style-type: none"> ○ “What are data?” ○ “Which statement accurately describes the FAIR principle of “Reusability” of data?” ○ “Why is applying the FAIR data principles beneficial for the scientific community?”