

Research Experiences for Teachers (RET) Site at WPI: Engineering for People and the Planet as Inspiration to Teach Integrated STEM

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Engineering for People and the Planet

Summer (6 weeks): **RESEARCH** \rightarrow Poster symposium

Prof Development (weekly):

- Research coffee sessions
- STEM Education PD and lesson planning \rightarrow lesson draft

Teacher cohort building, special activities

Academic Year: Lesson pilot in classroom; revisions \rightarrow lesson posted online

Quarterly Cohort meetings

Research mentors visit classes

Spring public presentation

Goal: To deepen the relationship of WPI and local public middle and high school STEM teachers/schools and develop a robust STEM Ecosystem in the Central Massachusetts (MA) region with high-quality, purpose-driven STEM that engages students to develop real-world problem-solving skills





Teachers spend 6 weeks doing authentic research in WPI faculty labs centered on the UN SDGs

Development of Miniaturized Noninvasive Blood Gas Monitors (Goal 3) Engineering Bench-Top Testing of Devices for Cardiovascular Diseases (Goal 3) Real-time Brain Sensing for Personalized Learning Environments (Goal 4) Assessing Battery-Free Computing Systems (Goal 7)

Photocatalysts for Clean Energy & Environment (Goal 7)

Bioinspired Harvesting Calcium from Water for Cement and Concrete (Goal 11) Waste-to-Energy: Engineering Feedstocks for a Circular Economy (Goal 12) New Water-Based Technology for Plastic Recycling (Goal 12)

The research projects contextualize and give meaning to science & engineering, and demonstrate the open-ended nature of *doing* STEM



Ten middle and high school teachers (in-service and WPI pre-service) conduct research towards the UN SDGs in WPI faculty labs for 6 weeks each summer



Cohort Year	# applied	# participants	In-service/ pre-service	Level: MS/HS	# URG	# Title 1 school
2022-23	25	10	5/5	5/5	2	4
2023-24	23	10	7/3	1/9	2	4
2024-25	27	11	7/4	3/8	2	5

When you frame STEM in the context of global change and social good, something interesting happens – more students want in.

m/news/sustainable-development-classroom-how-changing-world-and-stem-connect



Summer RET culminates in a public poster symposium.



Teachers present their research & lessons the following spring to a broad audience that includes the next RET cohort.



Teachers have PD each week during summer.



Teachers translate their research experiences into lesson plans that are piloted in classrooms and then finalized for online repository through weekly professional development (PD) sessions

Week	Topic and
1	Integrated S
2	The Engine
3	NGSS & St
4	Real World
5	Performanc
6	STEM Equi
Fall	Careers & S
Winter	Lesson Sha Presentatio
Spring	RET Prese

Outcomes: RET participants gain confidence and experience in research skills and teaching Integrated STEM, Engineering Design Process, and UN SDGs

Participants' Confidence in Research Activities (Pre-n = 10)

3.50 Identifying a clear research question 4.40 (Post-n = Doing a literature search/review 4.60 (Post-n = 1)3.10 ⊢ Designing an experiment 4.44 (Post-n = 9 3.20 ⊢ software) 4.60 (Post-n = 10)3.50 Using a lab notebook or journal 4.44 (Post-n = 9 3.60 Collecting data 4.70 (Post-n = 10)3.40 Analyzing data 4.50 (Post-n = 10)3.90 progress with others* 4.78 (Post-n = 9) 3.20 Revising research plans 4.60 (Post-n = 10)3.00 ⊢ Writing a research report 4.57 (Post-n = 7)3.20 Formally presenting research work 4.56 (Post-n = 9) Pre-Survey
Post-Survey

Using lab equipment or tools (including Sharing current research challenges and

"This experience changed my life. I made new connections with wonderful people, worked in a terrific lab setting, and reignited my love for science that will be shared with students." - RET participant, 2023





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