"Building Educational Bridges between Computer Science and Biology through Transdisciplinary Teamwork and Modular Curriculum Design" NSF #1742446



biocsbridge.wpi.edu

Our Bio-CS Bridge motivates integrated high school learning of science and computational thinking with a real-world citizen science Liz Ryder research project

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## Motivation for our Research Questions

## **High Impact Teaching Practices**

Adapted from Richard F. Vaz. "High-Impact Practices Work". Inside Higher Ed. June 4, 2019

#### High-impact teaching practices:

- project-based learning
- community-based learning
- involving students in research

#### Some Benefits and Challenges:

- promote active engagement
- involve collaboration, in and out of classroom settings
- can push students and teachers out of their comfort zones - <u>thoughtful</u> <u>implementation and support are needed</u> <u>for students and teachers to succeed</u>
- → WPI has been devoted to Ugrad Project-Based Learning very successfully for 50+ years
- → How can we share this expertise and transfer these high-impact practices to high schools?

# We are investigating: Engaging Student Learning

### with a Real-world Citizen Science Research Project

project-based learning + community learning + involvement in research

#### **Pollinator Decline Research**

Dr. Gegear (Co-PI) & Dr. Ryder (PI)

#### Why are our native pollinators in decline?



#### **Bio-CS Bridge**

Engages students and teachers in scientific practices using biological data they collect, and computational tools they help to design and implement



# We are also investigating: Transdisciplinary Team

Vertical Integration: high school & univ. student and faculty partnership



- active engagement
- collaboration
- expertise sharing
- joint curriculum development and implementation
- thoughtful implementation and support for students & teachers to succeed

Horizontal Integration: biology and computer science

## Insights: What we have learned so far

- Teachers report *strong student engagement* in initial pilot in 2 schools
  - Students enjoy collecting real data and contributing to a research database
  - Using and creating simulations and websites deepens learning
- Transdisciplinary team process was critical in generating truly integrated curriculum that fits teachers' needs
- Creating a balance all perspectives are essential – horizontal and vertical

- Communication is key
  - Learning to speak each other's language
  - Teacher input into software and tutorial development is key
  - What do teachers need to teach? New ways to convey content
  - Using e-communication tools effectively
- Creating cognitive artifacts visuals are important
- Presenting our work as a group cohesion and feedback

## **Next Steps**

**Short Term** (as part of this grant):

Continue implementation & assessment of our curriculum and team approach

Long Term (in future work):

Creating a blueprint for other university/high school partnerships around the country/world to:

- form *transdisciplinary* teams
- develop project-based, research-motivated curricula and student learning experiences:
  - in other Biological research problems + C
  - in other STEM disciplines + C
  - in non-STEM disciplines (e.g., Humanities) + C





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# Thank you

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