Evidence Sharing: Designing Middle School Science Storylines Integrating Sensor Technologies and Data -Driven Science

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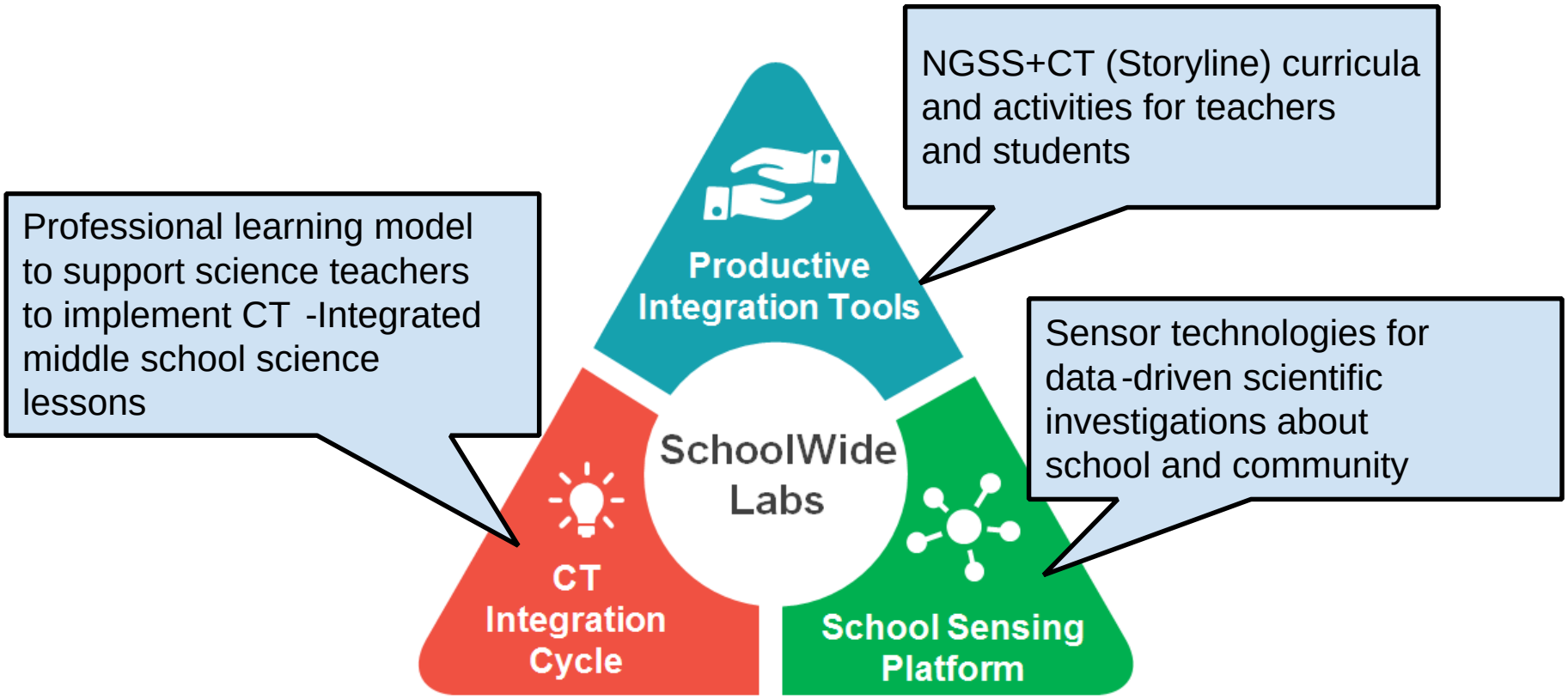
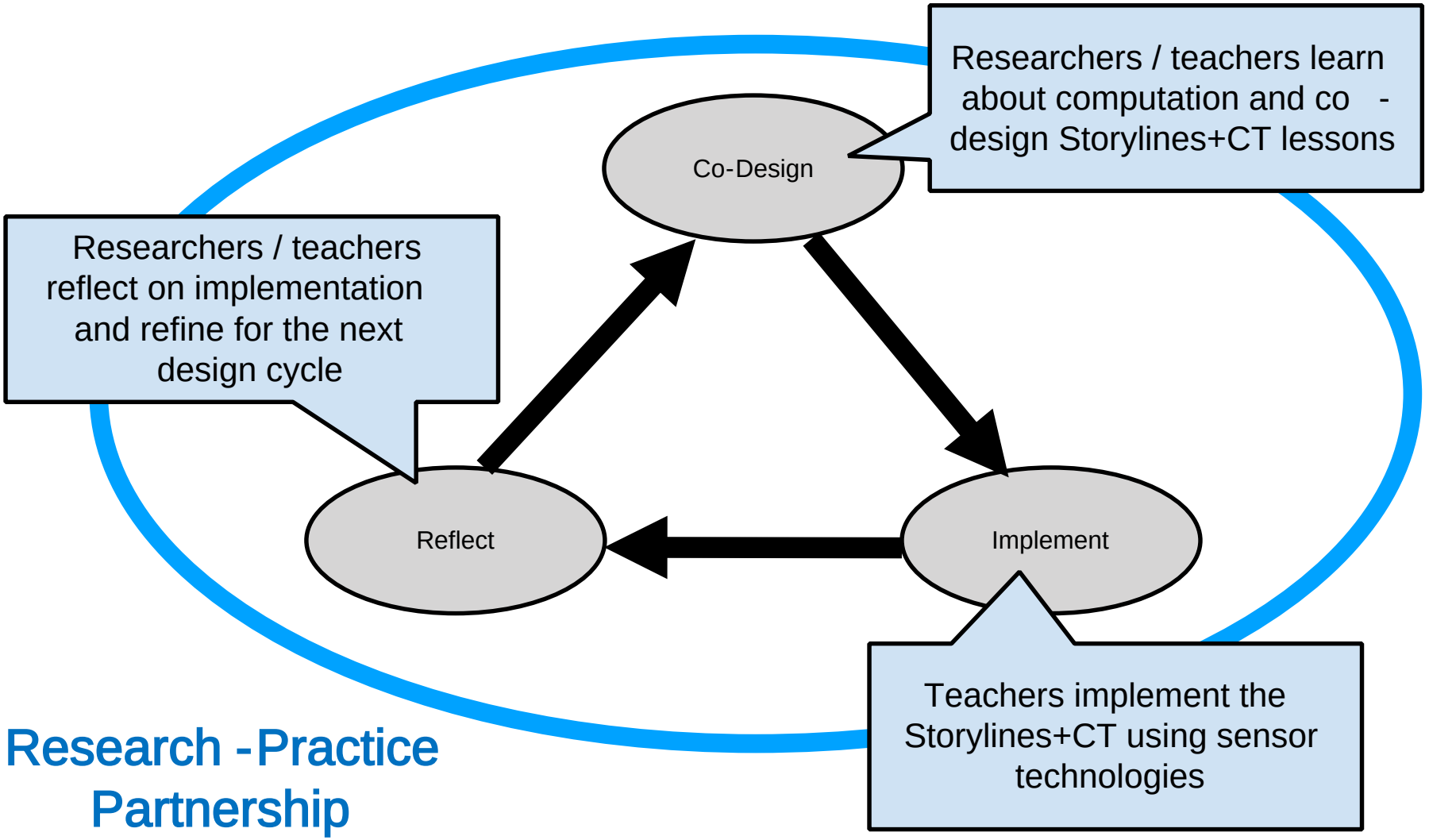
Project Goals



Broadening Participation in Computational Activities through Place -Based Investigations in Mainstream Science Classes

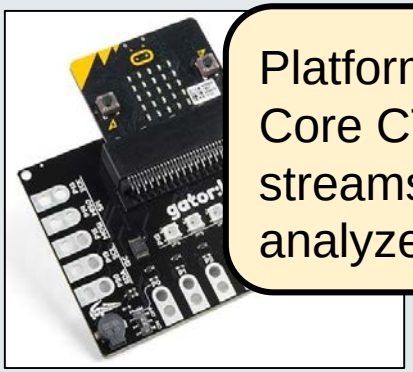
Professional Learning: CT Integration Cycle



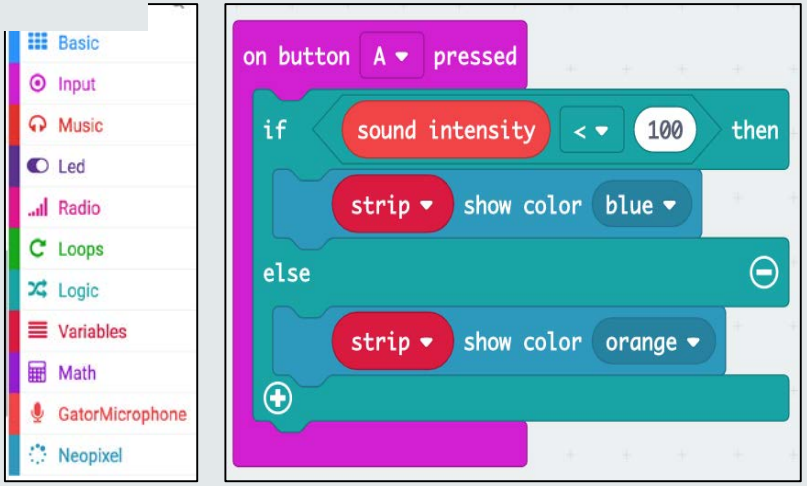
Research - Practice Partnership

School Sensing Platform

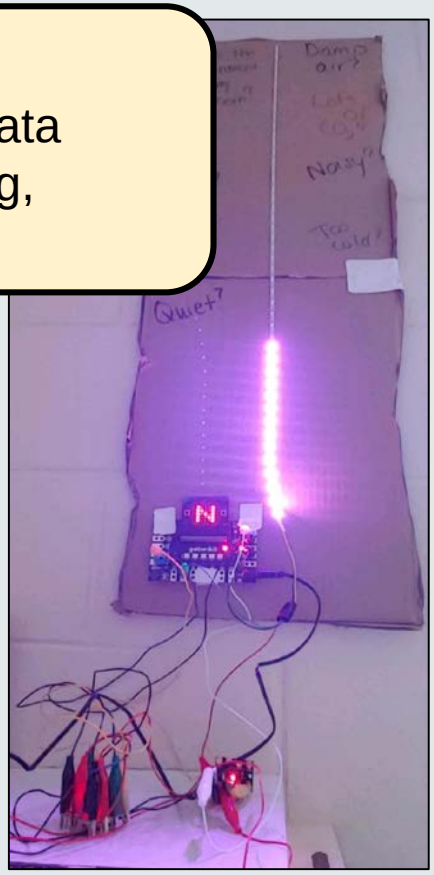
Platform is portable and affordable.
Core CT Practices (Weintrop et al., 2016): collect data streams with sensors, build models via programming, analyze & communicate using visualizations



Gator:bit which exposes more pins on the micro:bit for alligator clippable sensors. Additionally provides functionality for simple data displays using LEDs and a speaker.



Students program data collection, data analysis, and data displays using MakeCode.



Classroom data display that shows the conditions in the classroom: temperature, humidity, carbon dioxide, and noise.

Research Approach

Use iterative design-based approach to studying teaching learning over time

Middle School Participants:

- Y1: 3 science teachers; 363 students
- Y2: 5 science teachers; 488 students
- Y3: 10 science teachers; ? students

In each DBR cycle, teachers participated in CT Integration cycle: learn about CT, co-design storylines integrating CT via sensor technologies, enact in classrooms, and reflect/revise.

Use case study method to study different teachers' cycles

Evidence: Teacher Learning

Supporting teacher learning, participation, and agency:

- Use iterative design -based approach to studying teaching learning over time, as requires intentional design
- Use videos, interviews, and surveys
- Examine teacher learning in co -designing and adapting storylines
- Examine teachers as modelers

Supporting student learning:

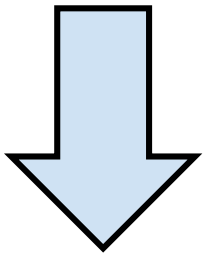
- Student exit tickets (Penuel et al., 2016)
- Student artifacts

Year 1

Lessons Learned	Adaptations for Year 2
More information needs to be provided to teachers about what is expected when implementing CT practices.	Integrate more CT activities into PD and make the goals of the CT practices more explicit
Highlighting the place -based aspect of scientific investigations supports student engagement.	Continue to highlight place as an important part of the units
A one week unit is likely too short to meaningfully implement many science and CT practices.	Create a longer unit with a richer set of activities
Limitations in Y1 storyline	Target phenomena that will yield a rich set of data for data driven analysis

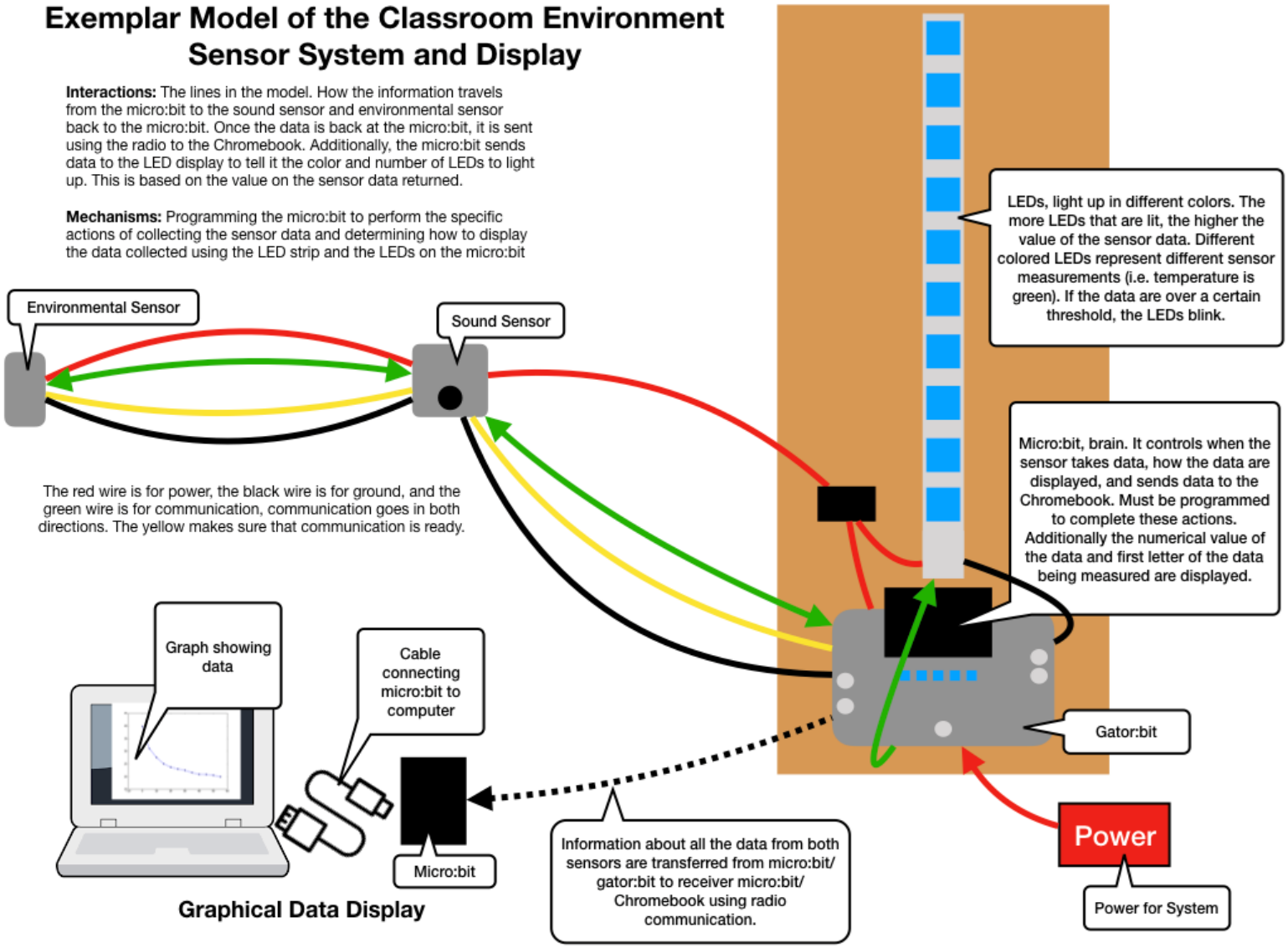
Year 2

Teachers want to introducing programming and the micro:bit as tools for scientific inquiry so investigations using those tools feel authentic to their students



Sensor Immersion Storyline where students investigate how a classroom sensor system collects, analyzes, and displays information

Sensor Immersion



Overarching Findings

Storylines are a useful approach to integrate CT, sensor technologies, and science in a complimentary way.

CT integrated science approach helps teachers see value of adding programmable sensor systems to their curriculum and can help students see sensor systems as tools for scientific inquiry.

Place based investigations of scientific phenomena as well as sensor usage and programming can play a large role to engage students.

A versatile sensor system supports students' engagement in CT and Science Practices.

Thanks

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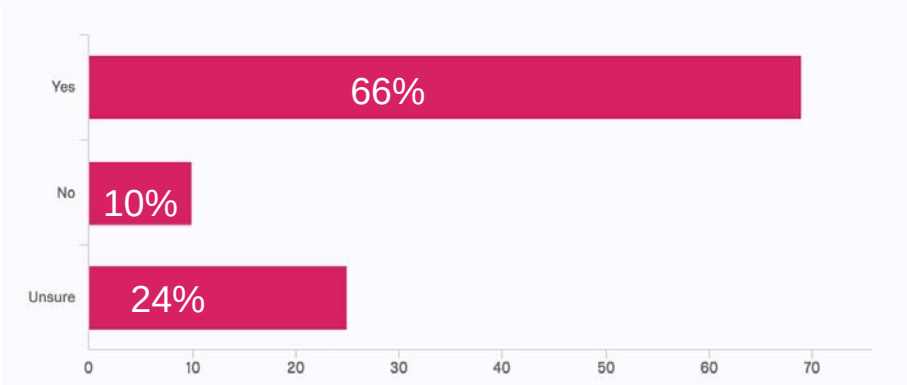
Coherence

I know what we need to investigate next.



I have some ideas about how to investigate and answer the questions we have.

SEET 2

SEET 3