# Science and Engineering Education for Infrastructure Transformation

Charles Xie[1], Şenay Purzer[2], & Chad Dorsey[3]

[1]Institute for Future Intelligence   [2]Purdue University   [3]Concord Consortium

Goals

To prepare tomorrow's STEM workforce for building our infrastructure, this project is:

1) Developing educational technologies and curriculum materials to support integrated learning of science, engineering, and computation concepts and skills underlying the "smart" and "green" aspects of future infrastructure.

1) Conducting research to identify technology-enhanced instructional strategies that can simultaneously foster the growth of skills and self-efficacy in scientific reasoning, design thinking, and computational thinking.
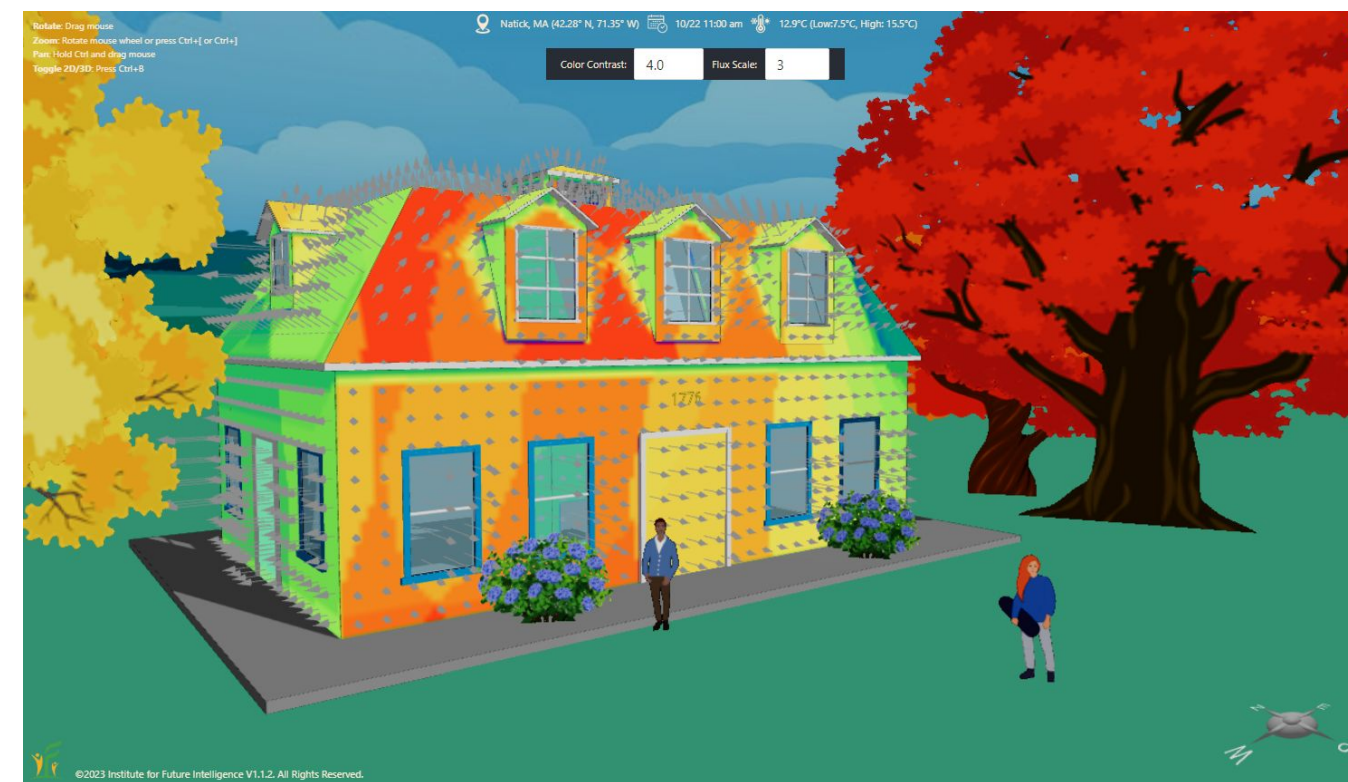
Sample Student Project: Design Green Buildings

Technology achieves the integration by allowing students to:
- see science at work in engineering
- deepen science learning via iterative design
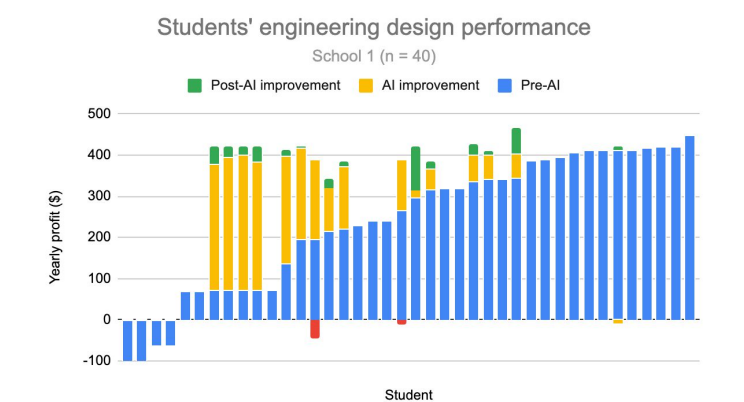- use computation to solve problems
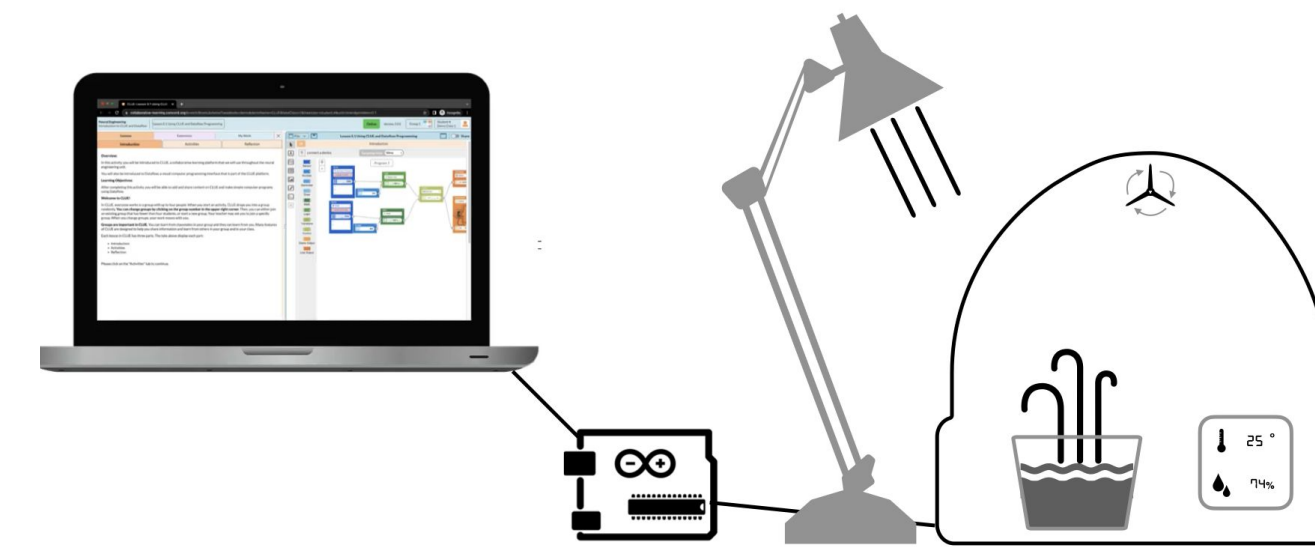

Sample Student Project: Smart Greenhouse

Integrated learning occurs when students:
- explore science through inquiry with sensors
- model science concepts and engineering principles as computational entities and flows
- design smart engineering systems with visual programming and computing

Findings

Adaptive feedback improves students' design performance
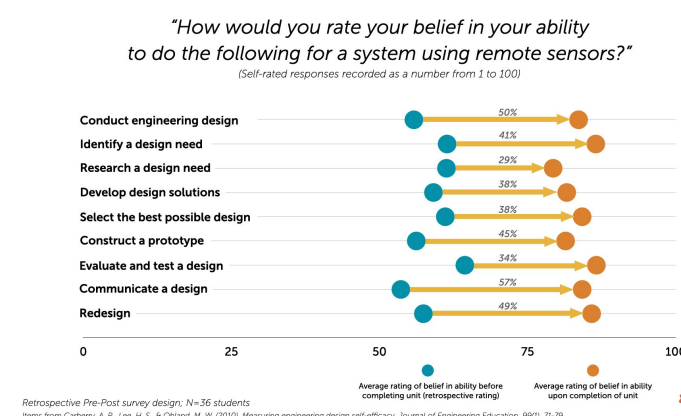
IoT technology increases students' self-efficacy in science & engineering

Scientific Reasoning — Design Thinking — Computational Thinking

Sample Student Project: Solarize Your School

Technology creates more learning agency by:
- situating learning in real-world projects
- providing "design gallery walk" on the cloud
- extending learning beyond the classroom
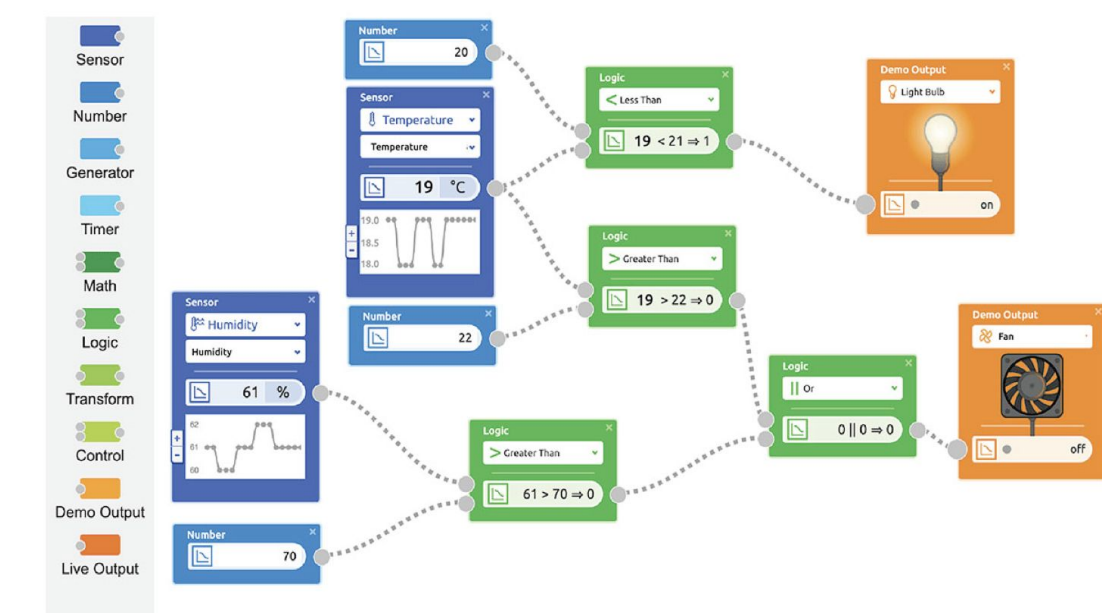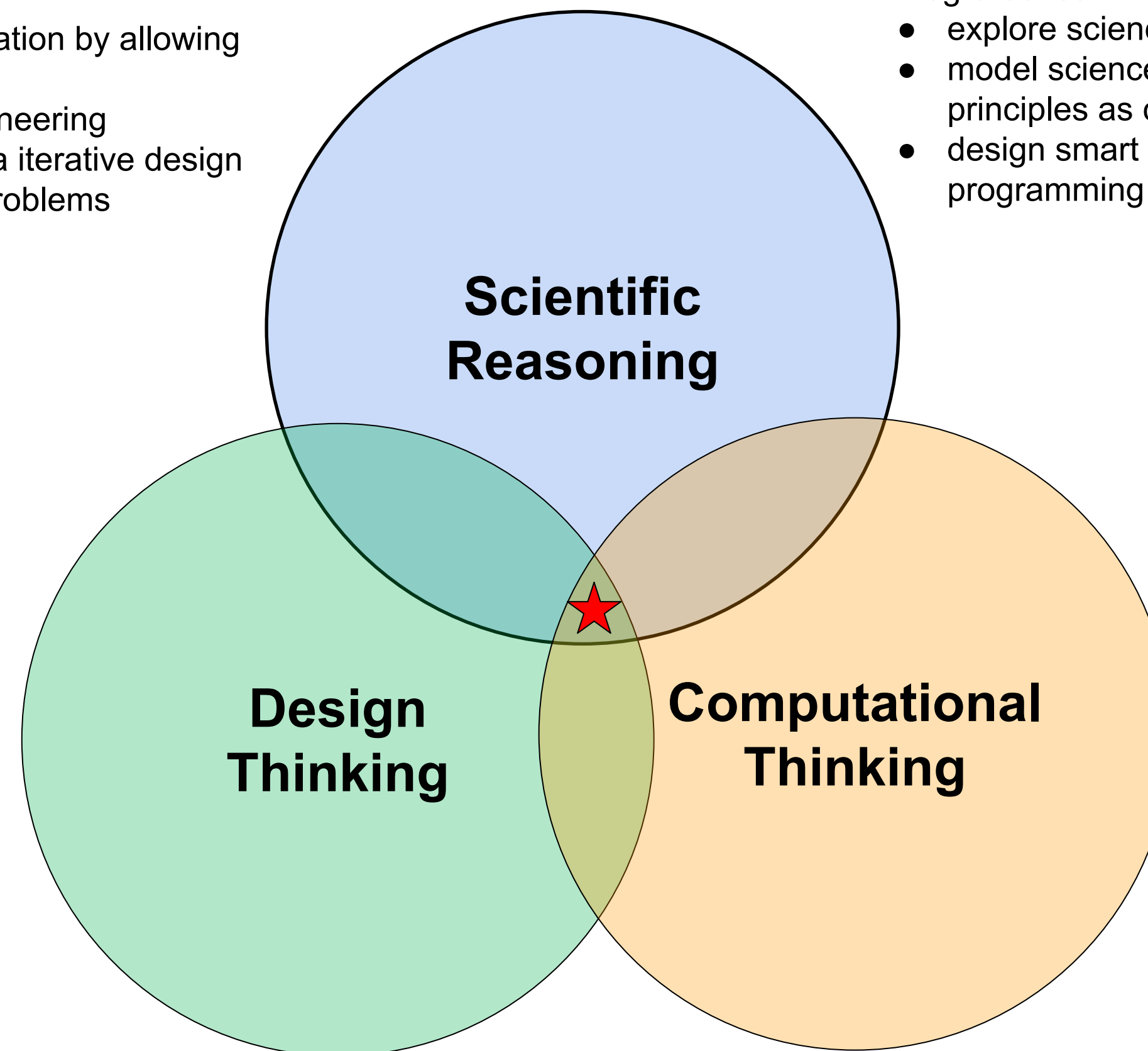
Sample Student Project: Data Science with Dataflow

Visual programming allows more students to:
- learn computation and data science without coding
- visualize science concepts with data flow
- use data science to inform engineering design

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