Building systems from Scratch
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The Building Systems from Scratch project, a collaboration between TERC and Northeastern University, is using multiple cycles of research and development to integrate systems and computational thinking into middle school science classroom learning about climate science by interweaving computer game design and climate science learning. Students are exploring a systems approach to learning about climate dynamics and climate change that integrates humans as a central component. The project is based on the idea that when young people build computer games, they construct knowledge at the same time. We conjecture that students learn science and computation practices, and the dynamics of climate science, better by building games than by direct instruction or student inquiry alone.

The instructional approach includes a view of students as knowledge producers, and of classrooms as networks of expertise distributed among students. Instruction includes:
- Collaborative pair programming for computer game design
- Student research of climate science based on videos, simulations, and modeling activities
- Critique sessions that are art studio-inspired
- A focus on game design as consisting of three related elements, reality (climate content), meaning (what the player is intended to learn), and play (how the final game product relates to computation)
- A focus on systems thinking that includes game-play, systems diagramming, and other supports.

In this session, participants will:
- Create a climate systems diagram
- Play and critique student computer games
- Use the systems diagramming activity and game design dimensions of reality, meaning, and play to storyboard a game about some aspect of climate change.