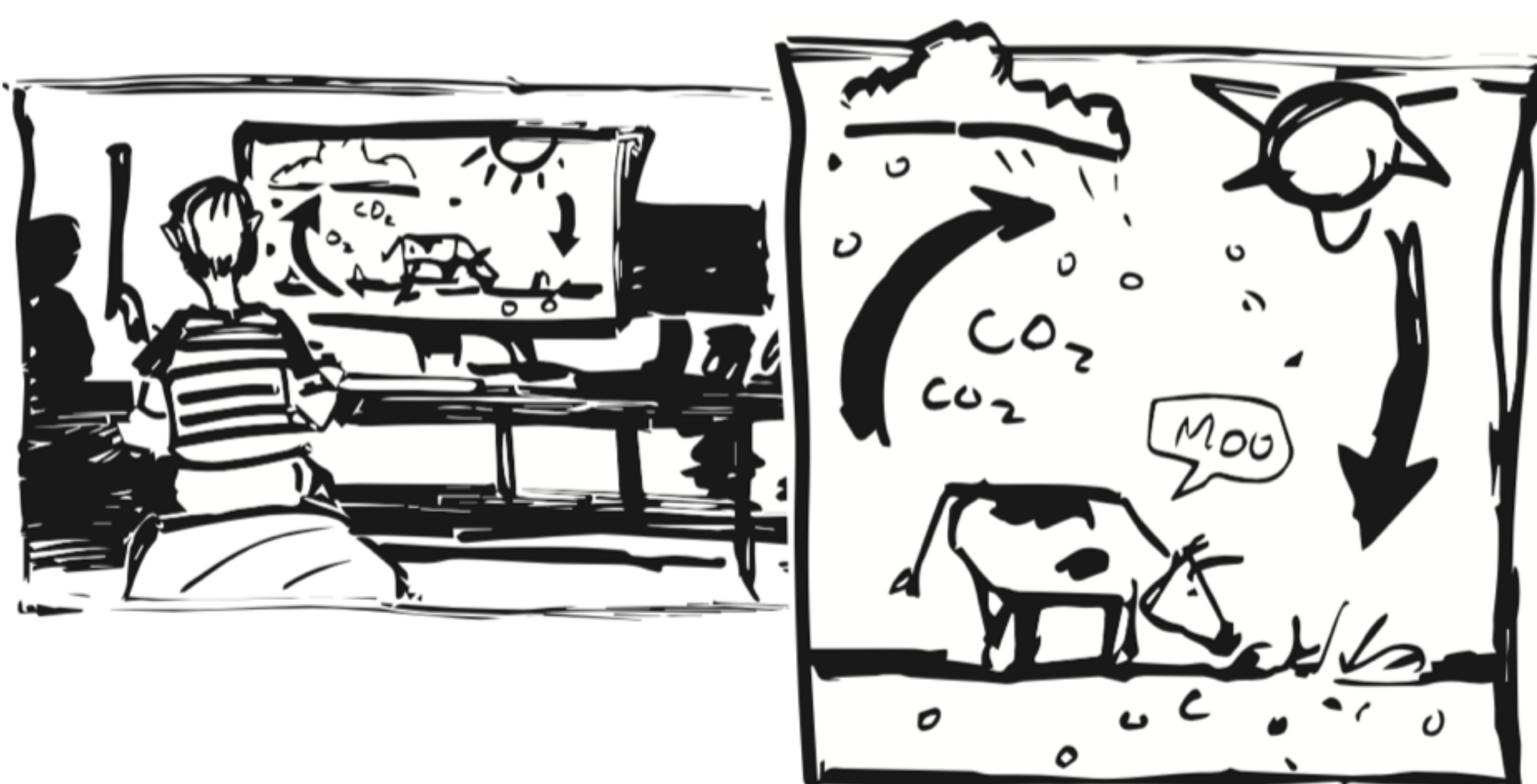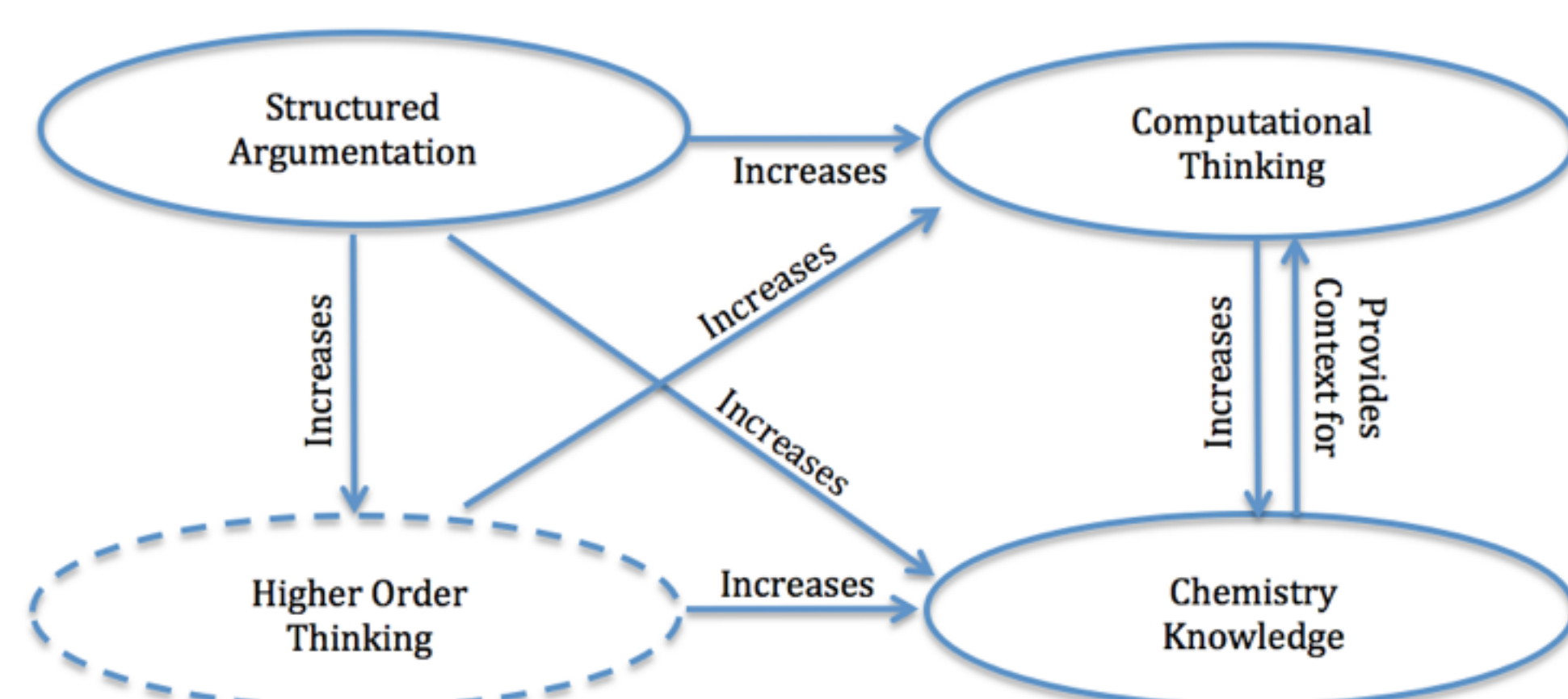# CHEM+C: Integrating Computational Thinking in the Middle School Chemistry Context

THE IDEA

- Address teachers' concerns about student STEM learning
- Deepen student STEM learning
- Introduce Computational Thinking (CT) in classes all students take
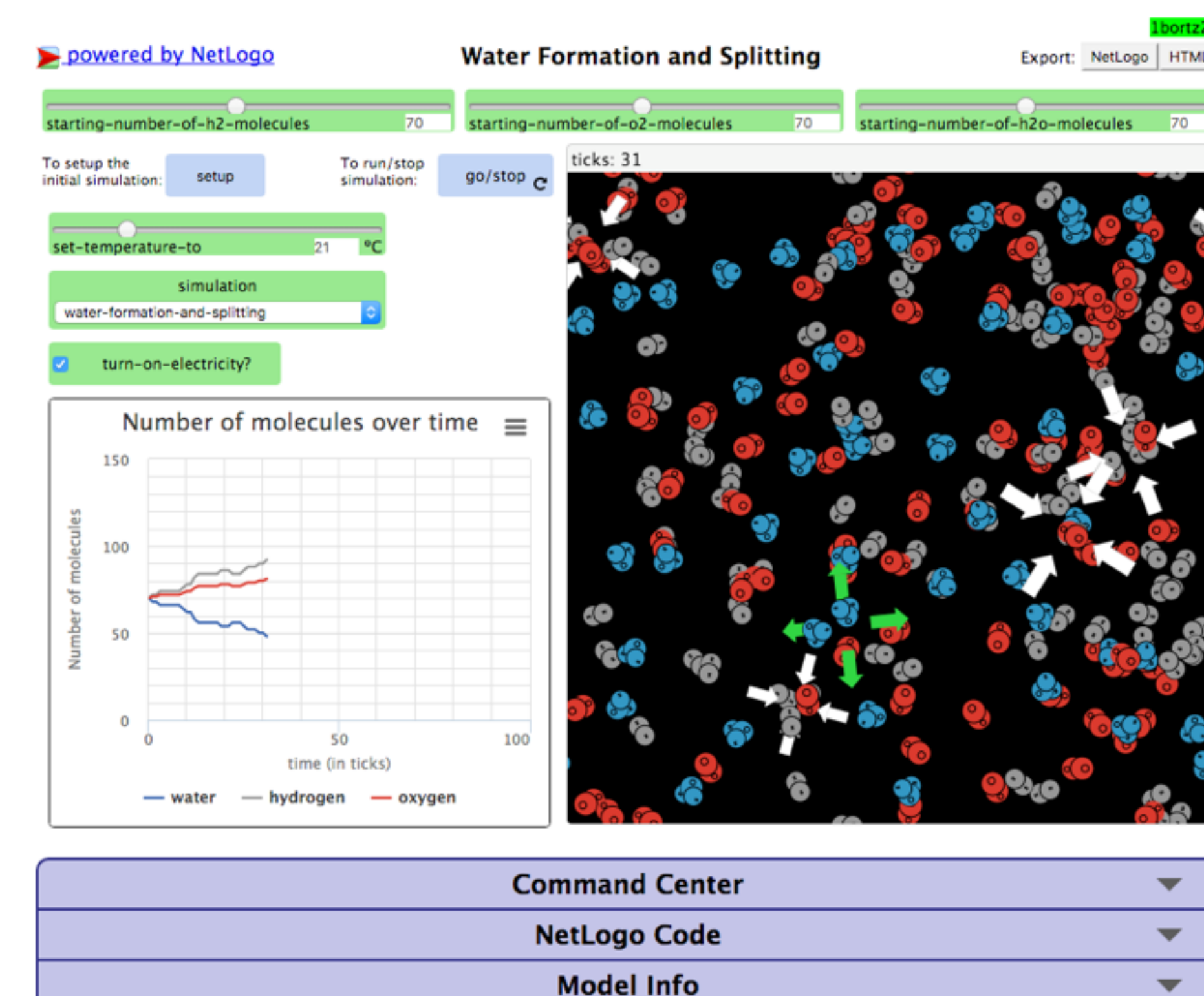- Engage with modern scientific practices in learning STEM subject areas

THEORY OF CHANGE

SETTINGS

Multi-week interventions in:
- Two 7th grade classes in rural VA
- Six 7th and 8th grade classes in Austin, TX

IMPLEMENTATION

Water Forming and Splitting

- **Anchoring Phenomenon**: Physical demonstration of the decomposition of water using epsom salts and a battery
- **Guiding Question**: What is happening that we do not normally see?
- **Key Science Concepts**: Atoms v. molecules, motion and collision, Conservation of Matter
- **Computational Thinking Goals**: Introduction to commands, objects, and properties

Aluminum Copper Sulfate Reaction

- **Anchoring Phenomenon**: Physical demonstration of the precipitate reaction between aluminum and copper sulfate
- **Guiding Question**: How do you know when a chemical reaction has occurred?
- **Key Science Concepts**: Atomic Theory, changes in temperature, concentration, state.
- **Computational Thinking Goals**: Procedures as description of process
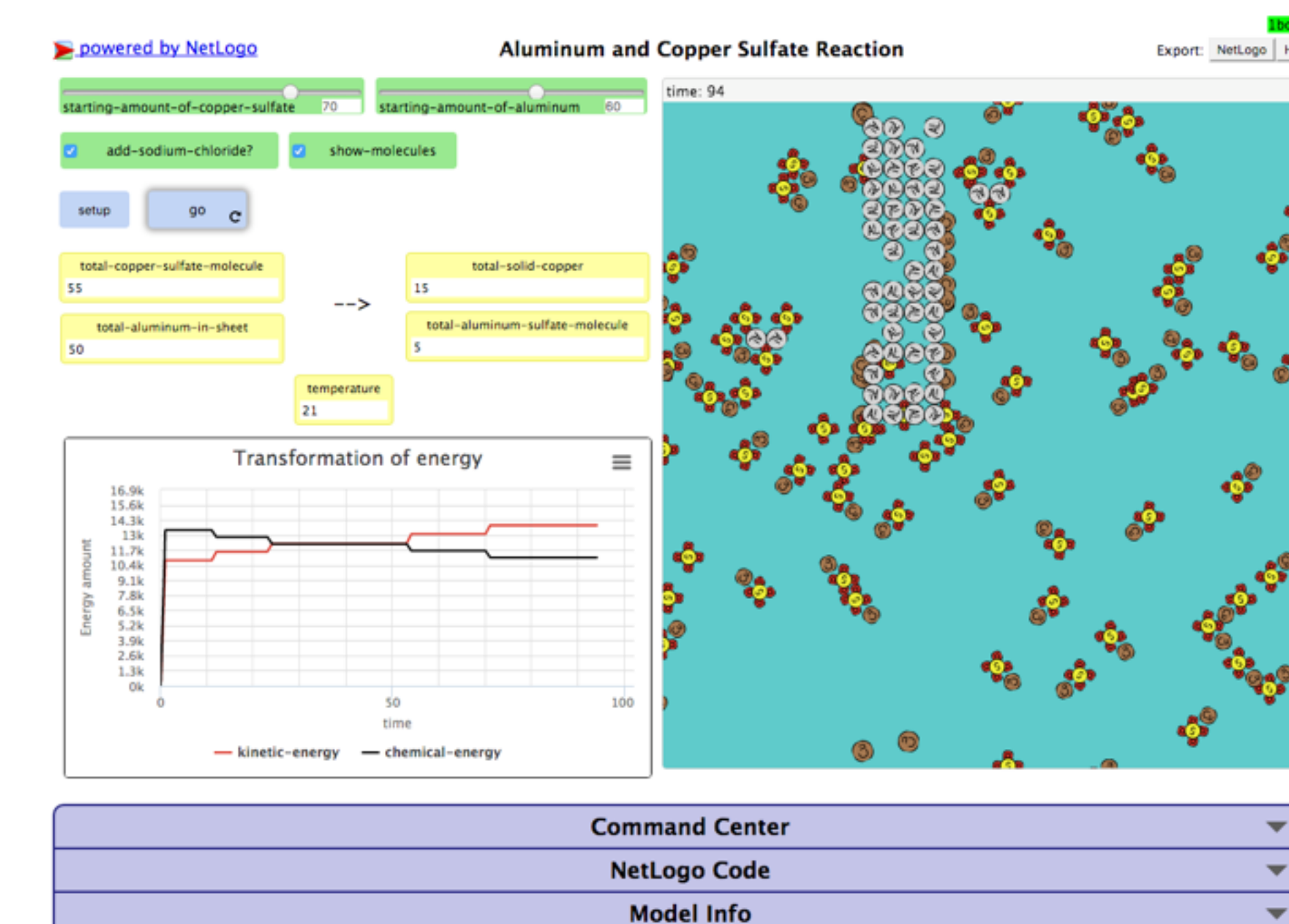
The Carbon Cycle

- **Anchoring Phenomenon**: The simulation *without* micro- phenomenon displayed.
- **Guiding Question**: How does Carbon move through the environment?
- **Key Science Concepts**: Carbon for life, chemical formation of glucose, respiration, conservation of energy
- **Computational Thinking Goals**: Using computational models to understand a concept
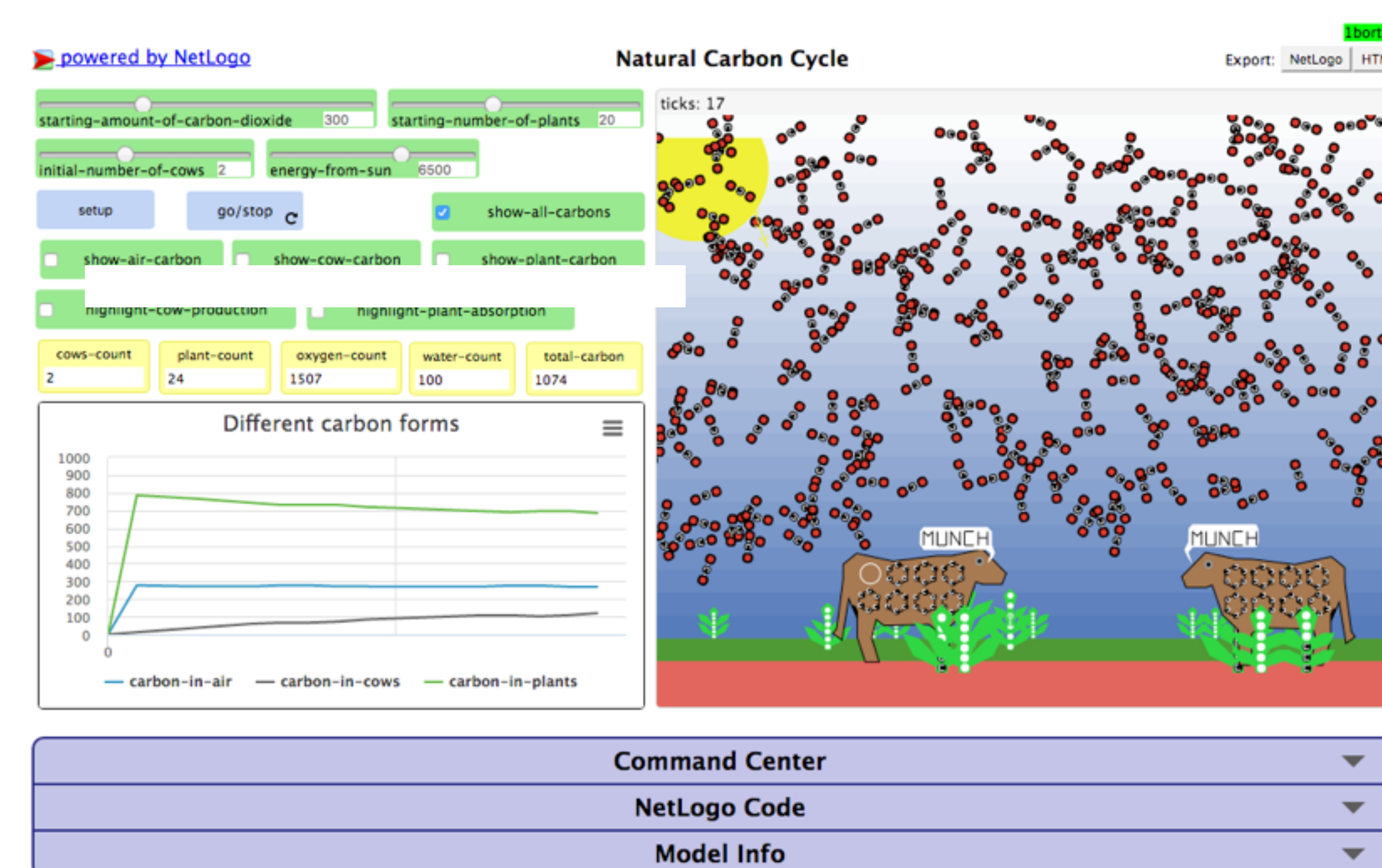
STUDENT EXPERIENCE

Students Engage with Various Types of Scientific Modeling

1. Physical Experiments
2. Student-created drawings
3. "Fact Sheets"
4. Computer simulations
5. Code

Analytic Approaches

- PACT - Performance Assessment of Computational Thinking (Following a validation process)
- CAT - Computational Attitudes Test
- Video analysis using qualitative data analysis methods and software
- Qualitative analysis of student-produced materials (i.e. posters, worksheets)
- Logged data from students' interactions with the simulations and code
- Horizontal analyses across data sources

TEAM

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