

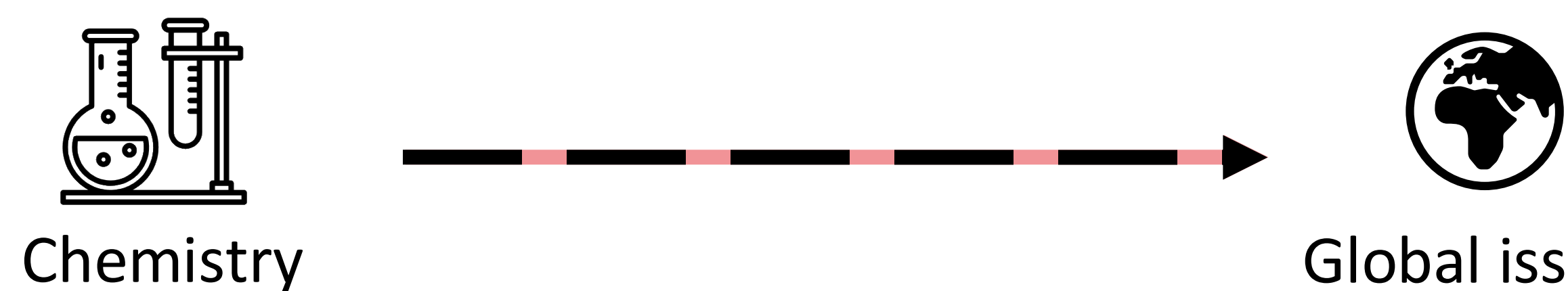
Alisha R. Szozda<sup>†</sup>, Peter G. Mahaffy<sup>‡</sup>, and Alison B. Flynn<sup>†</sup>

<sup>†</sup>University of Ottawa, Ottawa, Ontario K1N 6N5, Canada; <sup>‡</sup>The King's University, Edmonton, Alberta T6B 2H3, Canada

@arsozoda

## Current limitations in educational system

Traditional teaching typically compartmentalizes fundamental topics, often lacking knowledge and skills to make global connections.



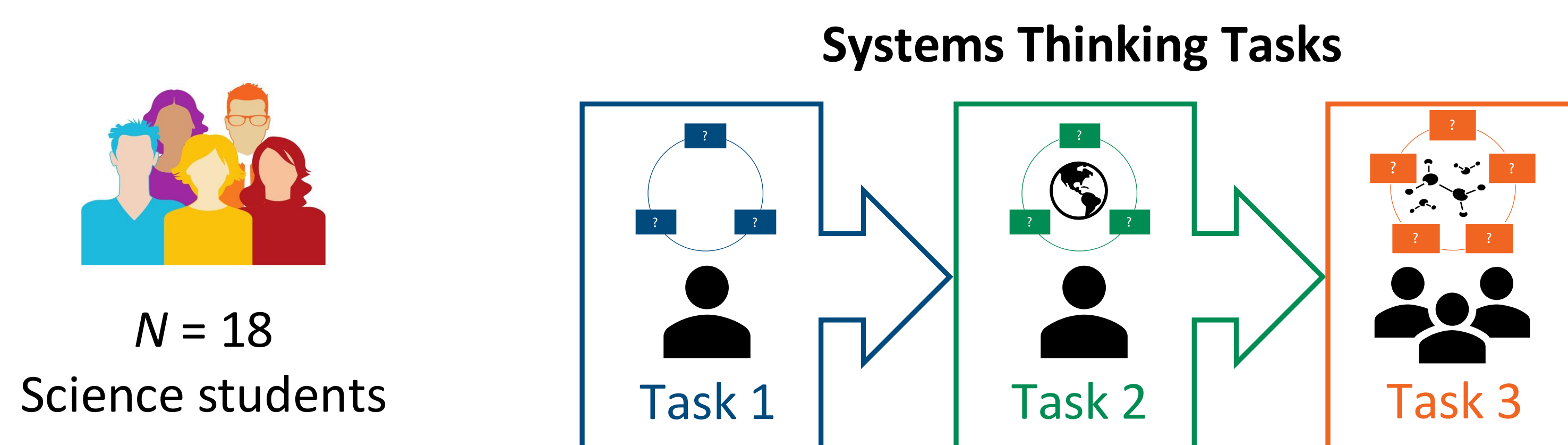
**Systems thinking (ST)** is proposed to directly connect chemistry topics to rich contexts by using systems thinking skills.

## ST is understanding and interpreting complex problems

Our study assessed 11 ST skills aligned with 5 characteristics of ST



## Systems thinking task protocol

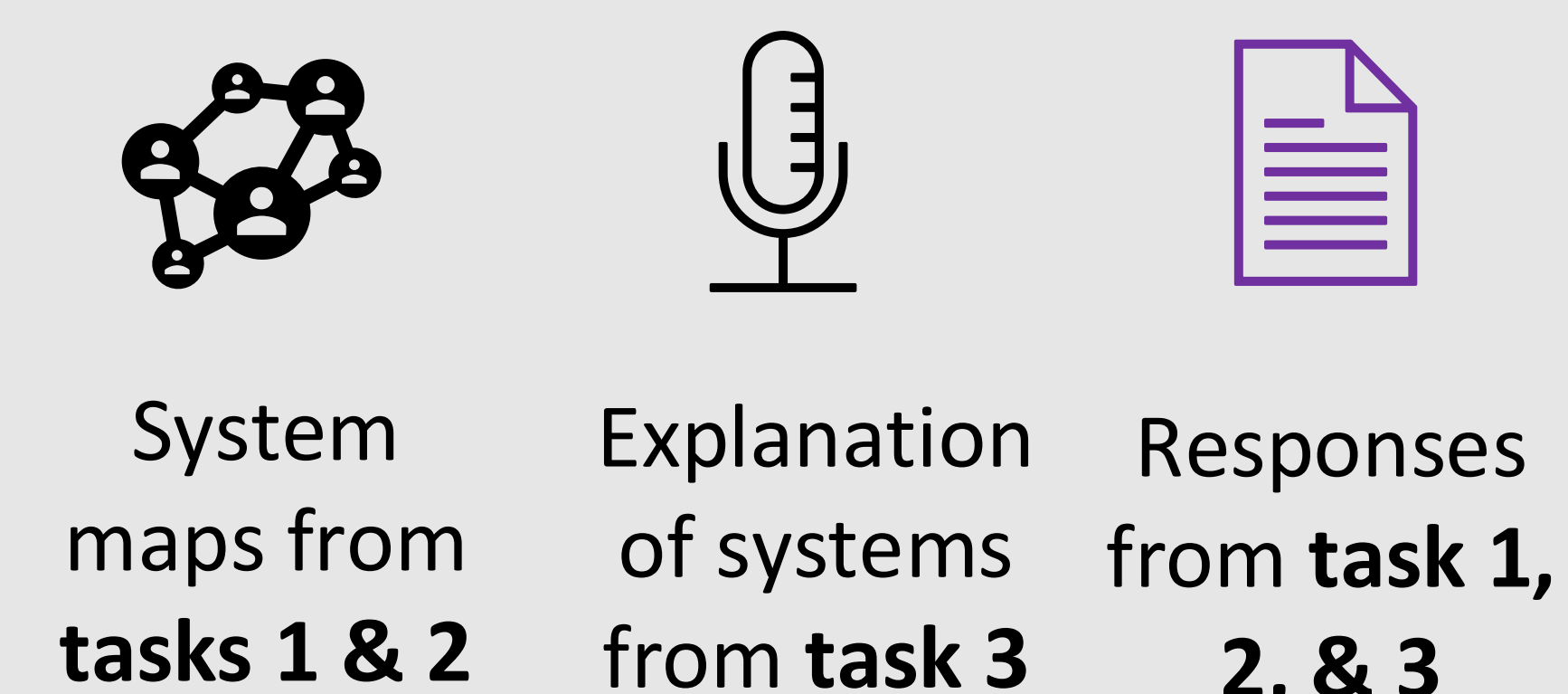


**1:** Created system map on climate change

**2:** Engaged with climate simulation to expand system map

**3:** Collaboratively created one system map from individual maps

Assembled data for qualitative analysis

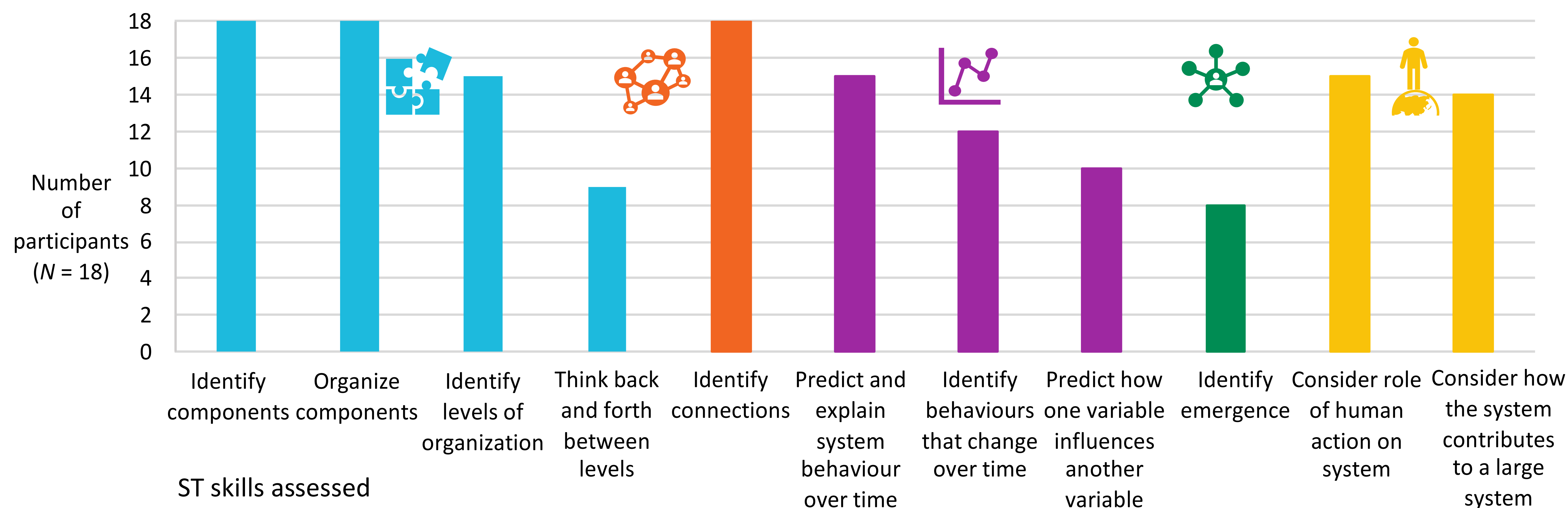


## Goal: Identify the baseline ST skills employed by students constructing system maps

**RQ1:** What ST skills do undergraduate chemistry students use without scaffolding to construct system maps?

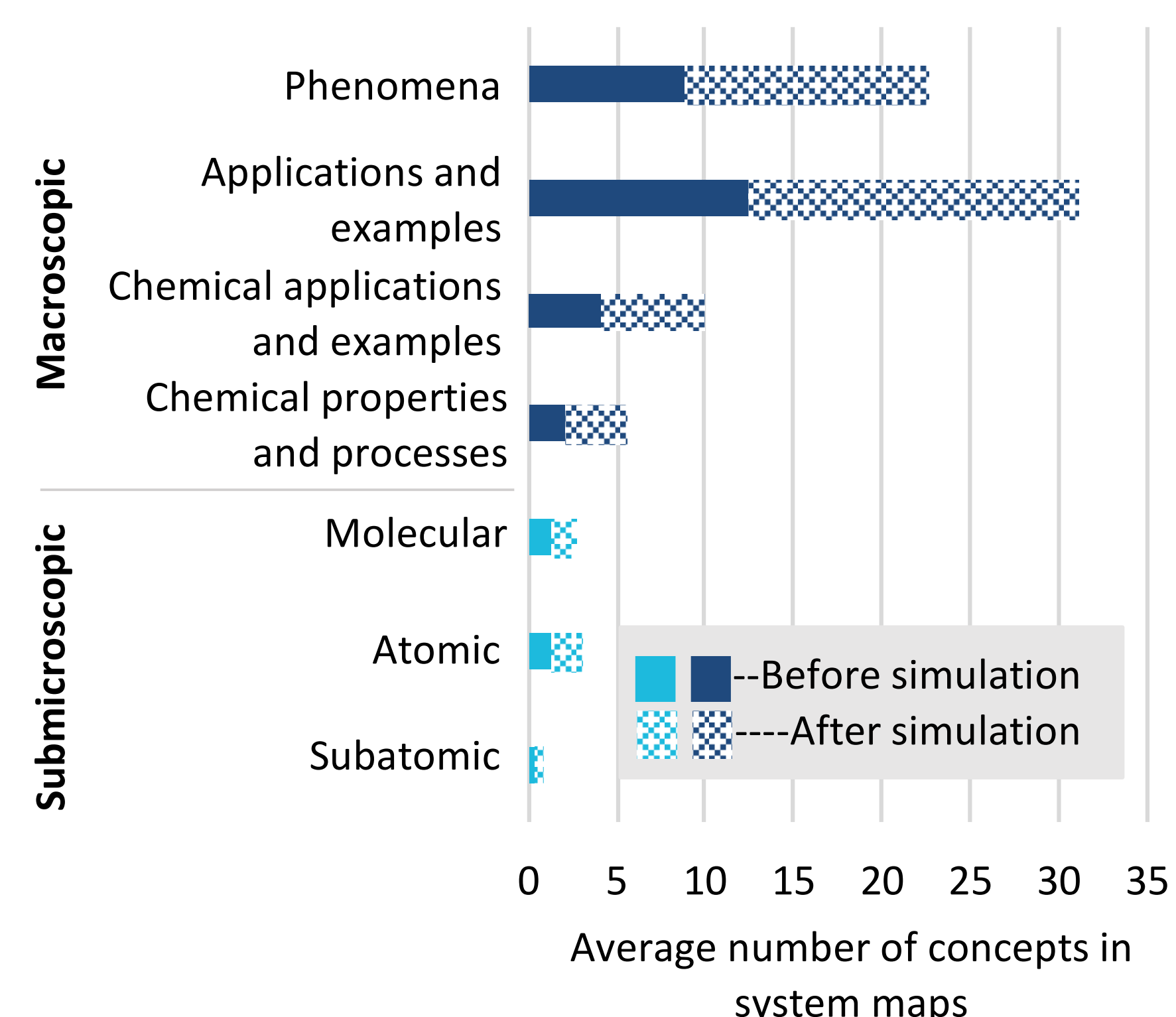
**RQ2:** To what extent do undergraduate chemistry students identify parts of a system (e.g., components, relationships, boundaries, and granularity)?

## Most participants demonstrated the 11 ST skills when engaging with the ST tasks

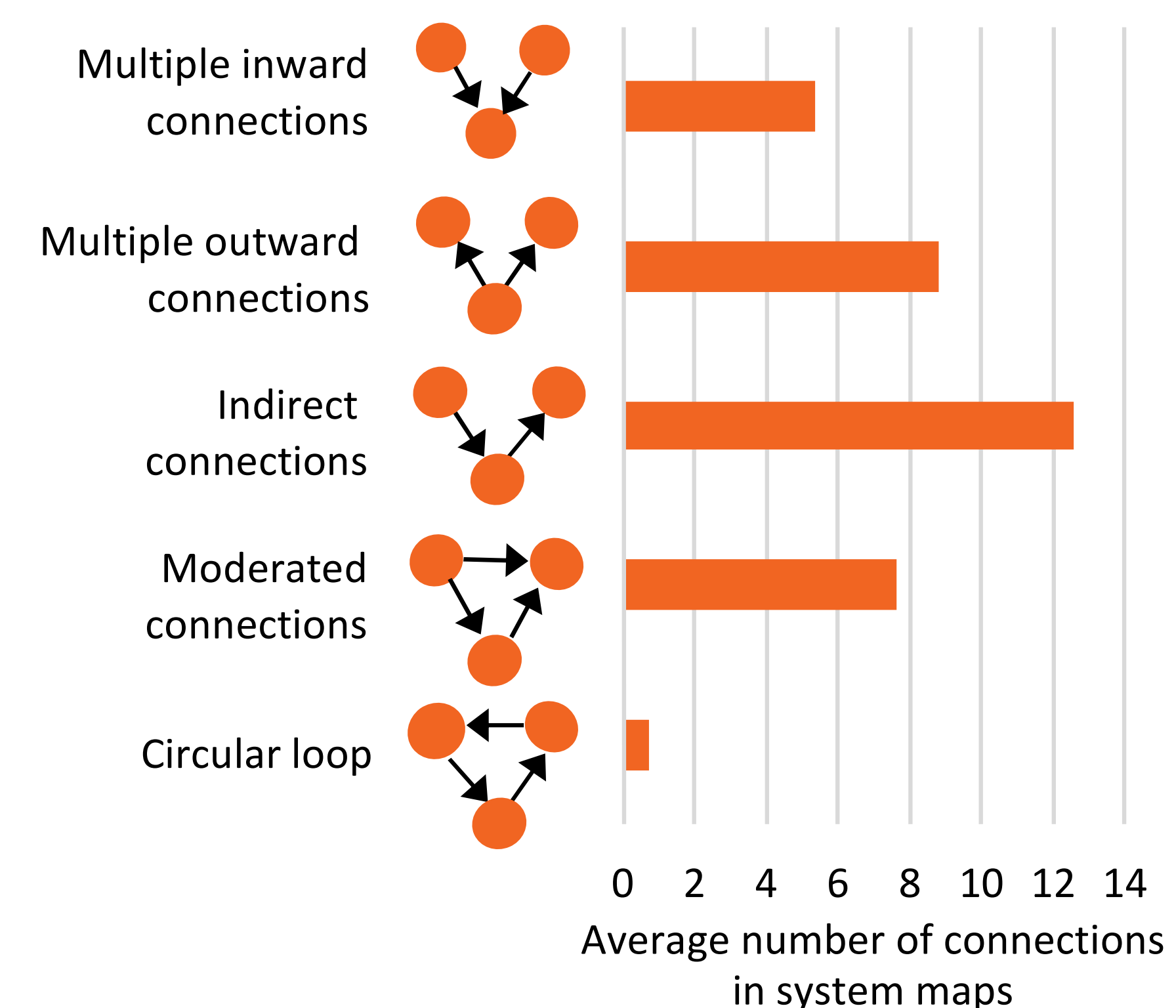


## Participants demonstrated multiple aspects of ST skills less frequently

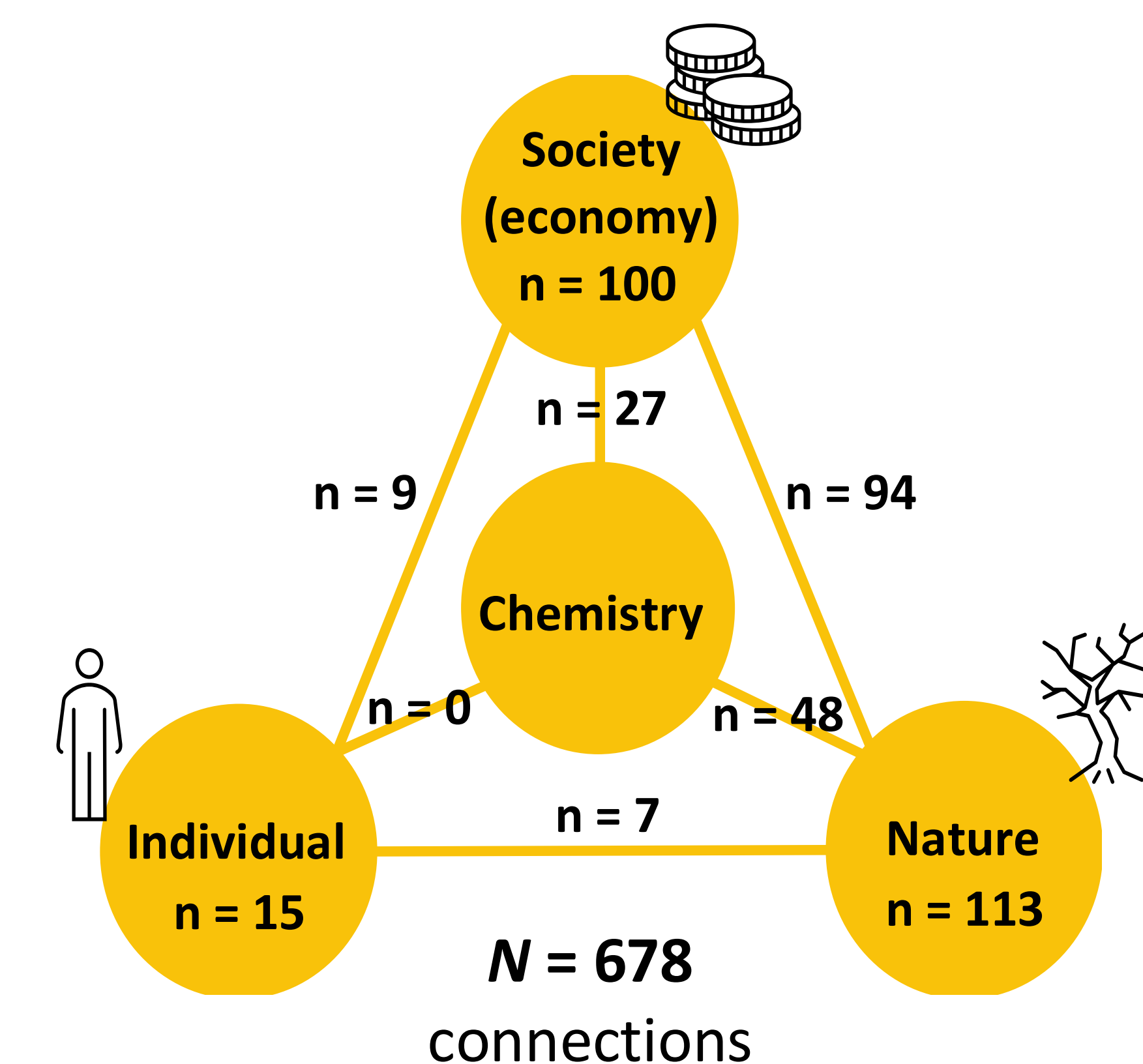
System maps had more concepts at macroscopic levels of granularity than submicroscopic levels



System maps had multiple types of connections but few circular loops



System maps had a breadth of connections but did not include human connections to chemistry



Purposeful prompts are needed for students to consider concepts at the submicroscopic levels

Scaffolded instruction is needed for creating circular loops

Purposeful prompts are needed for students to make more chemistry connections to human dimensions



Scan to read:

- Full article
- Full ST task protocol
- References & acknowledgements