**Systems Thinking in Chemistry for Sustainability: Toward 2030** and Beyond (STCS 2030+) Project # 2020-014-3-050 Building on Project # 2017-010-1-050

Systems thinking (ST) is one of five key competencies identified as essential for a sustainable future.

(*Redman & Wiek, 2021*)

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This project is also supported by the International Organization for Chemical Sciences in Development (IOCD)

# **Sponsoring IUPAC Bodies:**

- **Committee on Chemistry Education (CCE) Project lead**
- **Committee on Chemistry and Industry**
- Interdivisional Committee on Green Chemistry for Sustainable Development

# **Objectives:**

- Highlight and support inclusion of ST in chemistry education to emphasize chemistry as a central sustainability science
- Guide the use of ST in chemistry education



## **Dissemination**:

Explore roles for chemical industry

# **Key Outcomes:**

Featured project of IYBSSD2022-2023: "Systems thinking to link sustainability goals to chemistry education through the Planetary Boundaries framework."



International Year of Basic Sciences for Sustainable Development



The KCVS planetary boundaries interactive visualization showing the status of the Earth system processes that keep the planet in balance and highlights the role for chemistry.

- Featured on the IUPAC homepage to celebrate the International Day of Education with the theme "Changing Course, transforming education". (Jan 2022)
- "Systems Thinking and Sustainability: Converging on chemistry's role in the 21st Century" featured in Chemistry International. (Oct 2021)
- "Integrating Sustainability into Learning in Chemistry," editorial in the Journal of Chemical Education to coincide with Earth Day. (Apr 2021)
- "An Interactive Planetary Boundaries Systems Thinking Learning Tool to Integrate Sustainability into the Chemistry Curriculum," J. Chem. Educ. (Sep 2022)
- SaSTICE, a new website (link coming!) built by KCVS to provide educators with a hub for systems thinking and sustainability resources and tools. (2022-23)

Search



SOCKit, a KCVS dynamic interactive SOCME building tool for educators and students to connect concepts and subsystems together in a visual and interactive way.

Incorporation of "Systems Thinking" into chemistry teaching

#### Plan

- **Define** learning objectives
- Contextualize with socio-environmental problem or phenomenon
- Focus on identifying systems and subsystems
- **Design** learning activities

#### Implement

- Map out problem/phenomenon to be analyzed



### **Sustainability and Systems Thinking In Chemistry Education**

Does our teaching of chemistry equip citizens to cope with the changing world?

Why is sustainability so important in chemistry?

What is systems thinking?

### Next steps:

Dissemination through web site, talks, and workshops Project extension requested from CCE.

- **Zoom in** to engage students in relevant physical/chemical/biological interactions within and across systems
- **Zoom Out** to system level interactions and organization
- **Connect** through activities earth and human systems to problem/phenomenon

#### Assess

• Learning Objectives per each implementation phase • Inform instructional decisions and planning

STICE Integration into chemistry teaching, a tool for educators created by Vicente Talanquer and the project group.

- How to get started incorporating systems thinking into teaching.
- Examples under development: ocean acidification, surfactants, and plastics.

### **Project Members:**

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