The effectiveness of a systems thinking visualization tool for first-year chemistry Micke Reynders, Lynne Pilcher, Marietjie Potgieter

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Background

o We are facing emerging global sustainability challenges and an action plan is required to address the environmental, social and economic impacts that human activities have on our planet.

o The **reductionist approach** to chemistry education has caused students to experience chemistry as isolated, fragmented, and without a **holistic meaning**.^{1,2}

Methodology and Data Collection

Post Practical

Questionnaire

Students will be required to apply 0 systems thinking skills to critically evaluate the impact of surfactants, in this case, alkylbenzene sulfonates, on the various systems and subsystems of society, the environment, and the economy.

- Chemistry, introducing systems thinking would provide a In Ο framework from which fundamental chemistry knowledge can be interlinked human-environmental interactions to and the sustainability agenda.³
- Integrating systems thinking in chemistry education will equip Ο students with the necessary skills to address sustainability challenges.⁴
- o System-Oriented Concept Map Extensions (SOCMEs) are used to develop systems thinking skills in students.



- Case-study research design, mixed methods with an explanatory approach to data collection.
- Participants: 15 volunteers, Mixed Ο purposeful sampling (stratified and maximum variation)
- Data collected from: Quizzes, SOCME Ο diagrams, reflections, online recorded observations



Project

Introduction

15 min

Prior

Knowledge

Quiz 1

Jig-saw cooperative design incorporated in parts of two practical sessions



AIMS

This project aims to implement a systems thinking visualization tool, SOCME diagram, in an intervention to develop systems thinking skills in first-year chemistry students and to assess the extent to which systems thinking skills are demonstrated using the SOLO taxonomy

Research Questions

To what **extent** will a systems orientated **visualization too**l, implemented during an first-year chemistry module, develop systems thinking skills.

- Which systems thinking skills were students able to demonstrate on their SOCMEs?
- What level of complexity (pre-structural, unistructural, multistructural, relational or extended abstract) were students able to illustrate on their SOCME?

