Using Socio-Scientific Issues (SSI) in The Context-based Chemistry Learning

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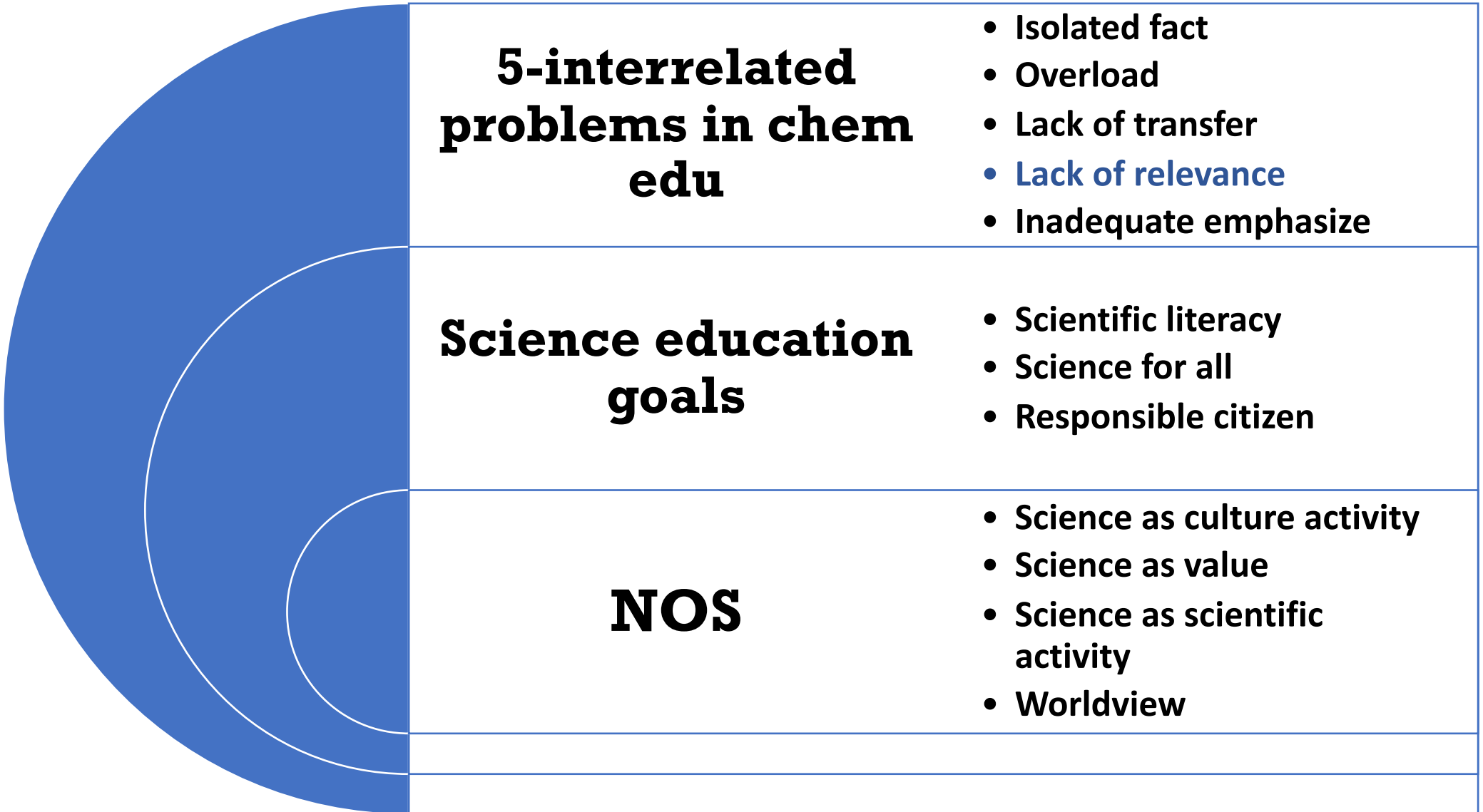
OVERVIEWS

- Why is CbCL
- What are CbCL & Framework
- What is Context
- SSI as context
- Practice

WHY Context-based Chemistry Learning (CbCL)?



5-interrelated problems in chem edu	• Isolated fact • Overload • Lack of transfer • Lack of relevance • Inadequate emphasize
Science education goals	• Scientific literacy • Science for all • Responsible citizen
NOS	• Science as culture activity • Science as value • Science as scientific activity • Worldview

WHAT is CbCL?

Context-based approach → **Learning as context engagement**

Context-based learning → **Using the context during the learning process to develop the curiosity**

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Contextual teaching and learning

A SUMMARY OF THE CONTEXT-BASED PROGRAMS IN SEVERAL COUNTRIES (Ultay & Calik, 2012)

Context-based approach	Country	Age/level	Description
Salters Advanced Chemistry (SAC)	UK	17–18 year olds	SAC emphasizes industrial and real-life applications of chemistry
Chemistry in Context	USA	18–20 year olds	It focuses on a meaningful connection between students' learning of chemistry, and their daily life and societal issues
ChemCom	USA	Upper secondary	ChemCom integrates community issues to chemistry
Industrial Chemistry	Israel	12th grade	Industrial Chemistry provides with the opportunity to describe the contexts of real situations and actual problems that exist in the chemical industry
Chemie im Kontext (ChiK)	Germany	10th and 11th grades	ChiK aims at the improvement of chemistry teaching at secondary school in Germany
Chemistry in Practice (ChiP)	The Netherlands	Secondary	Aims at creating meaningful connection between chemistry and daily life and societal issues

FRAMEWORK OF CbCL

- **Constructivistics (Social Cognitive/Vygotsky & Situated Learning Theory)**
- **Cognitive apprenticeship**
- **Concept development and Transfer**
- **Using a context with several models**
- **A sense of wonder and curiosity about natural world**
- **A 'need –to-know' principle in selecting content (subject matter)**
- **Students' engagement actively**
- **Learning environment**

WHAT is CONTEXT?

A context is a focal event embedded in its cultural setting
(Duranti & Goodwin, 1992, p. 3)

Four Attributes of Contexts

- SETTING OF FOCAL EVENT (as a social, spatial, and temporal framework used by community) ➔ science relevance concept
- BEHAVIOURAL ENVIRONMENT (to frame the talk, type the activity/action)
- SPECIFIC LANGUAGE (as the association between the focal event and scientific concepts)
- EXTRA-SITUASIONAL BACKGROUND KNOWLEDGE (the background knowledge that is required)

FOUR MODELS OF CONTEXTS (Gilbert, 2006)

1. As the direct application of concept
2. As reciprocity between concepts and applications
3. As provided by personal mental activity
4. As the social circumstances

3 & 4 are most Viable and Relevant

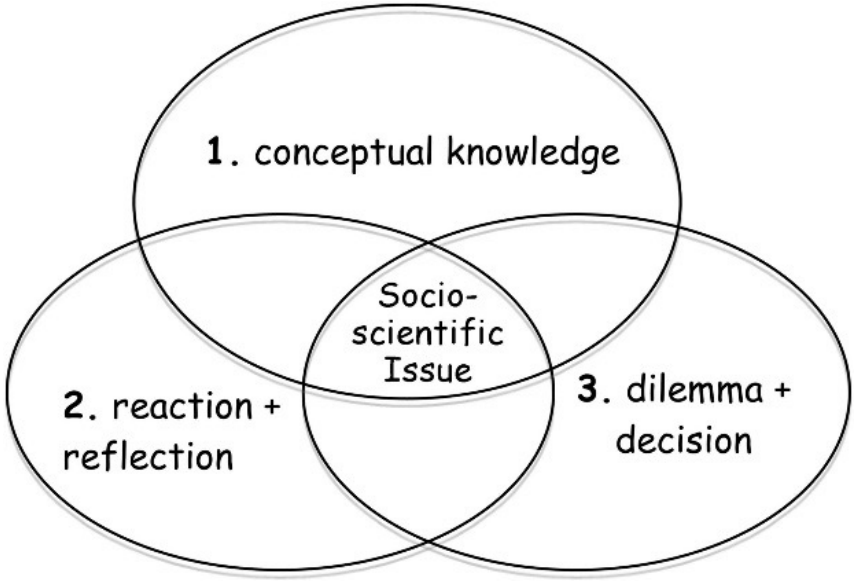
most effective and represent the basis for ideal of CbCL

WHY SSI as Context?

- The selection of appropriate contexts is vital for CbCL to actually improve students' interest and perception of relevance
- SSI supports socio- cultural perspective of science science/chemistry education
- SSI has several dimensions that related to science relevance dimensions
- Reflecting the fourth model of contexts
- Supporting scientific literacy

Socio-Scientific Issues…..

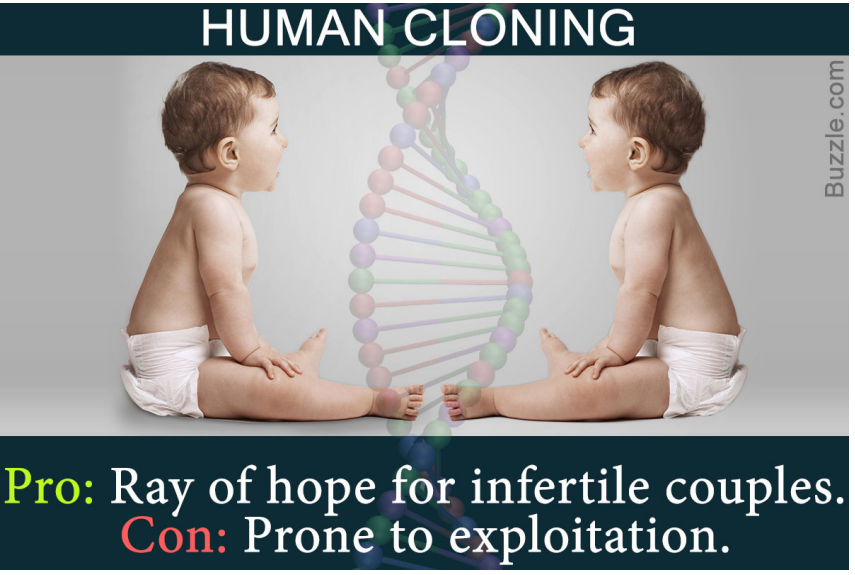
- An issue about which there is no one fixed or universally held point of view
- An issue often divides society, because different groups may offer conflicting explanations and solutions
- A combination of science and society



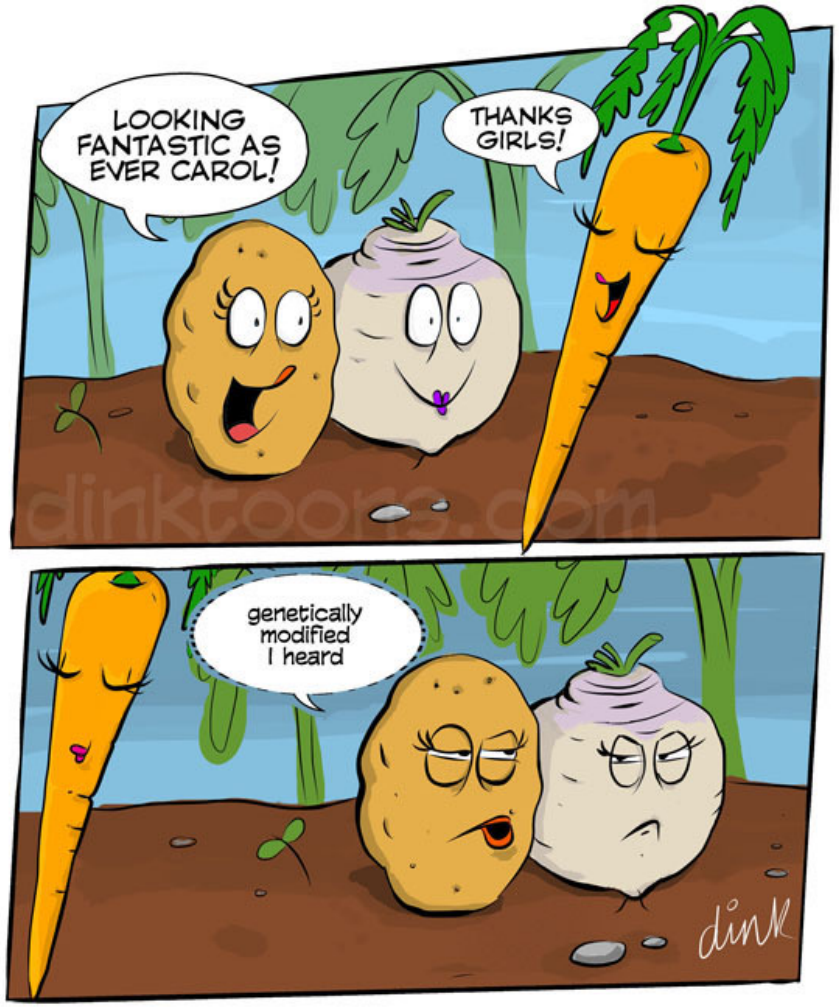
KEY FEATURES OF SSI…..

- ill-structured problems/issues
- different key beliefs/understandings/values
- insufficient evidence
- a lack of a clear-ut solution
- a lack of consensus within the scientific community about the issue
- open-ended
- complex
- contentious dilemmas
- rational solutions derived from the underlying premises
- multiple dimensions
- Negotiaton
- SSI in context depends on culture, society, and national/societal characteristics

DIMENSIONS OF SSI



- ❑ economical,
- ❑ political,
- ❑ religious,
- ❑ ethical,
- ❑ environmental,
- ❑ health,
- ❑ scientific,
- ❑ technological,
- ❑ societal,
- ❑ moral



- ❑ alternative medical treatment,
- ❑ Fossil fuels
- ❑ climate change/global warming,
- ❑ nuclear power plant,
- ❑ organic agriculture,
- ❑ Rainforest and biodiversity,
- ❑ hydroelectric power plant,
- ❑ overhead power lines,
- ❑ mass vaccination,
- ❑ Nutrition (e.g., dietary supplements, rice consumption, cooking oil, soft drink)
- ❑ tourism in historical place(s)
- ❑ Chemical in Medicine
- ❑ Food Additive
- ❑ Addictive
- ❑ acid rain
- ❑ road salting,
- ❑ Tattoo
- ❑ mining (i.e., extracting gold with hydrogen ciyanide),
- ❑ adding supplemental chemical products into packaged foods,
- ❑ using naphthalene in toilet
- ❑ Coral reefs
- ❑ Volcanoes
- ❑ Medical use of alcohol
- ❑ Water resources
- ❑ Plastics
- ❑ Abuse of chemical substances
- ❑ Chemicals and environmental pollution

Common SSI handled in the relevant literature

Using SSI as Context, for example…

- ✓ The use of borax in food
- ✓ Acid rain
- ✓ **Coral reefs**
- ✓ Cyanide acid in "gadung" (Dioscorea hispida)
- ✓ The habits of chewing betel leaf
- ✓ Ulcer medicine for fasting people
- ✓ Glass cleaner

Setting of focal event; phenomenon of maritime country, manifest throughout the world in different ways (resources, damage)

Behavioural Environmental: what actions do they take? Maritime regulation, restriction of touristic activities

Specific language: pH of Acid base, chemical equilibrium (shift factors)

Extra-situasional background knowledge: Acid base theory, acidification, elements, minerals on sea; marine organisms, coral growth

Using SSI in CbCL, for example…

Implemented by

Predict-Observe-Explain-Extend (POEEd) Strategy

Developing scientific habits of mind

Better on open-mindedness and objectivity factors but less on curiosity

Supporting Chemical literacy

Need to be improved on SSI awareness and decision making skills

- ✓ Boundaring and focusing the context
- ✓ Connecting to chemistry concept appropriately
- ✓ Designing the context-based materials
- ✓ Understanding of the concept transfer (i.e., mental models)
- ✓ Understanding of the value transfer (i.e., awareness and responsibility to societal problems
- ✓ Conditioning the appropriate learning environment

CHALLENGES…?

Further readings

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Thank you…

Terima Kasih…

Teşekkür ederim…

Maturnuwun sanget kagem bapak mentor ingkang sampun kersa ngoreksi paparan punika