Curriculum Integration for Scientific Literacy and Social Responsibility: A Case Study of Students' Perceptions of Learning through a Socio-scientific Issue-based Unit

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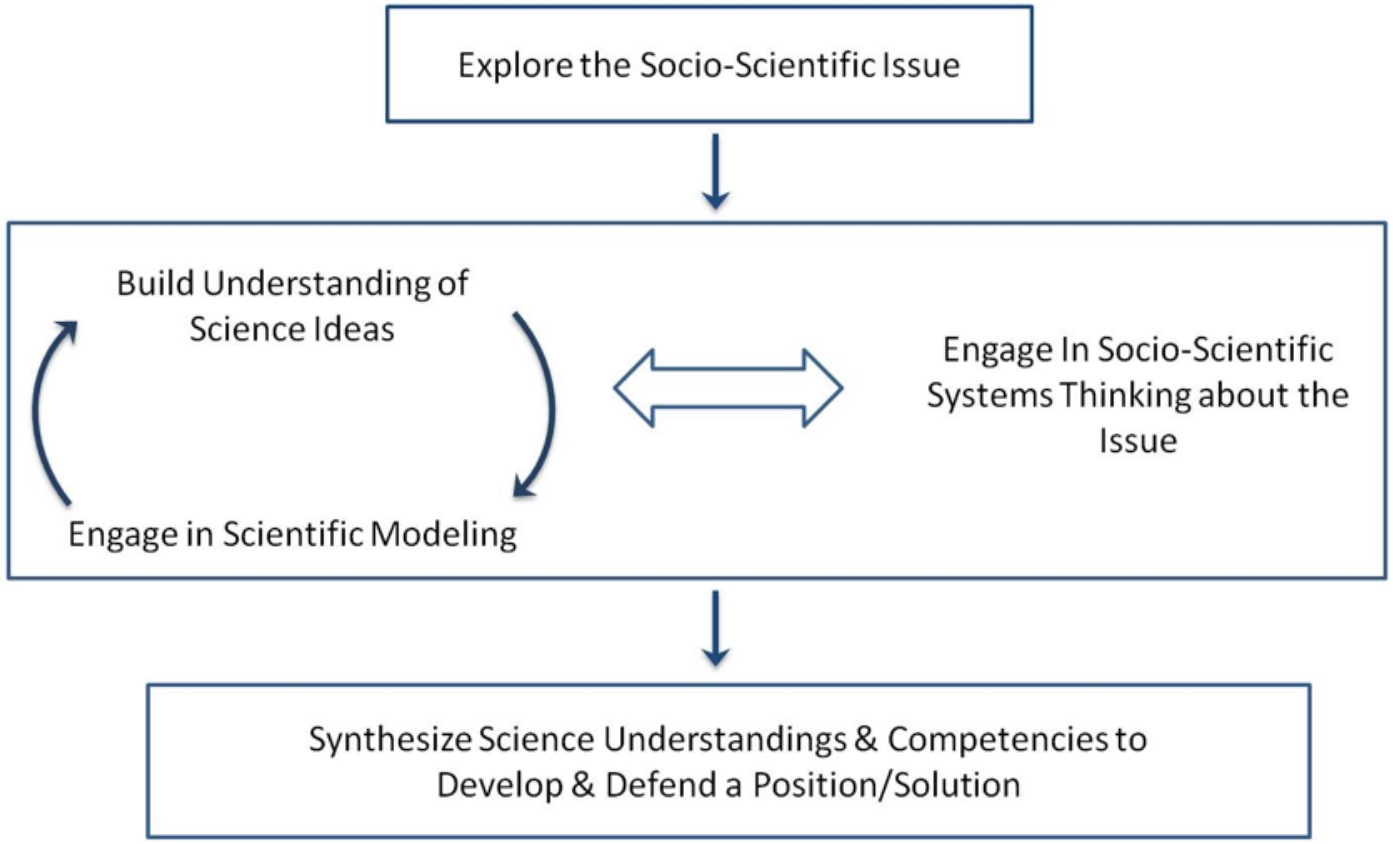
11/02/2019

Socio-scientific Issues (SSI)

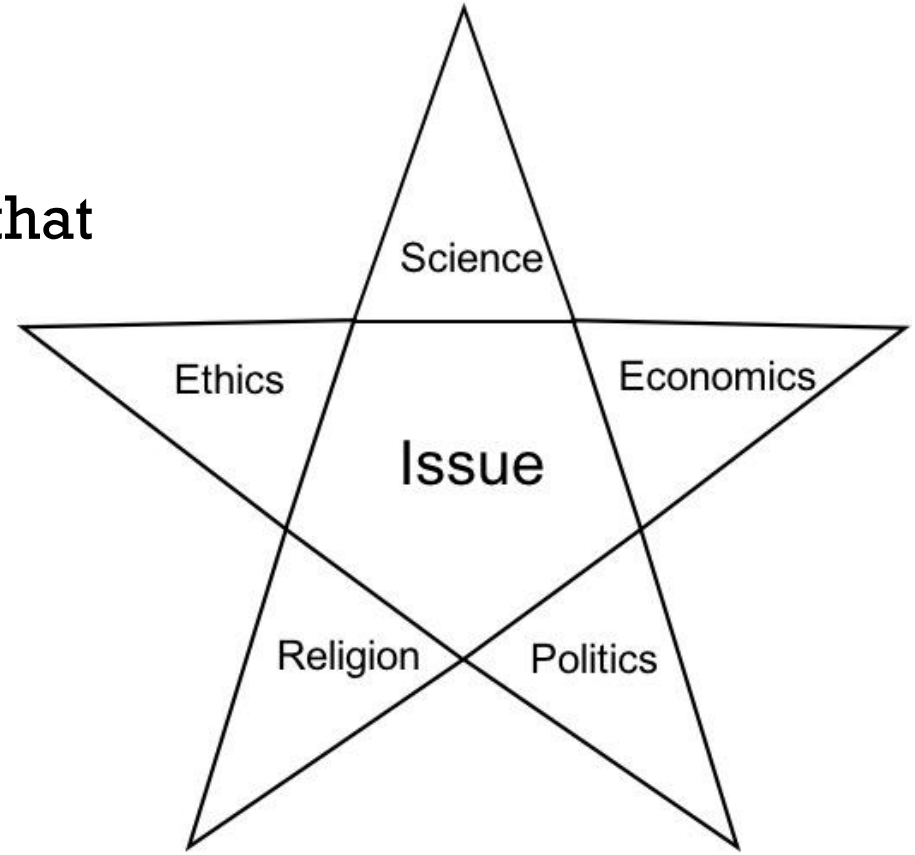
- SSI are complex, ill-defined, critical societal issues (such as climate change and genetically-modified organisms) that have a basis in science (Sadler, 2011).

Teaching Sequence for SSI



SSI and Curriculum Integration

Students need to explore different dimensions of the complex societal issues so that they can develop their own positions or solutions.



Rationale of the Study

- To date, most research on SSI focuses on effects of the SSI interventions in terms of *learning products,* as opposed to *learning processes*

- Prior research indicates that it is challenging to engage students in the epistemic aspects of SSI learning (e.g., systems thinking)

- It is critical to have a better understanding of students' perspectives on SSI learning as they should be positioned as active epistemic agents within the classroom knowledge building community.

Research Questions

1. What are students' perceptions of their engagement in socio-scientific issues-centered learning?

2. How do students perceive and appropriate epistemic tools for system thinking in the context of socio-scientific issue-centered learning?

Methods

- Design of the study: a case study
- Contexts: A high school in the southern of the U.S.
- Curricular materials: A issue-based vaping unit co-designed based on the SIMBL framework by the biology teachers
- Primary data source: a total of 33 focus students' semi-structured interviews after the unit
- Data analysis: Constant comparative approach (Glaser & Strauss, 1967) to develop codes to characterize students' perceptions of the learning experiences of SSI and their appropriation of epistemic tools for systems thinking.

Findings—Students' Perceptions of Learning

1. Relevant to students' lives
2. Stimulating student interest in science
3. Promoting student agency
4. Promoting students' social responsibility

Illustrative Examples

“I'm glad that we talked about it in school, because I definitely think as high school students – I'm impacted by it. My friends are impacted by it. I see it constantly. I think it really relates to what's going on, and I think it's good that it was taught because it's something that, it's actually happening with us. It's good to learn about it and know the causes and the effects of something that us as high schoolers were all going through.” (relevant)

I do think it [the vaping unit] was very interesting. Most of the time I've been in school districts where they're like, this is a flower, these are the parts of the flower, that's it. And I'm like, okay. That's not that interesting. I've never been this into science, actually. I was okay at science, but then this year I actually kind of got best of both worlds, because I love social studies and I love government stuff. Like just hearing those opinions of people, and then getting that to mix in with another class is actually really cool, especially when it helps you learn. (interest)

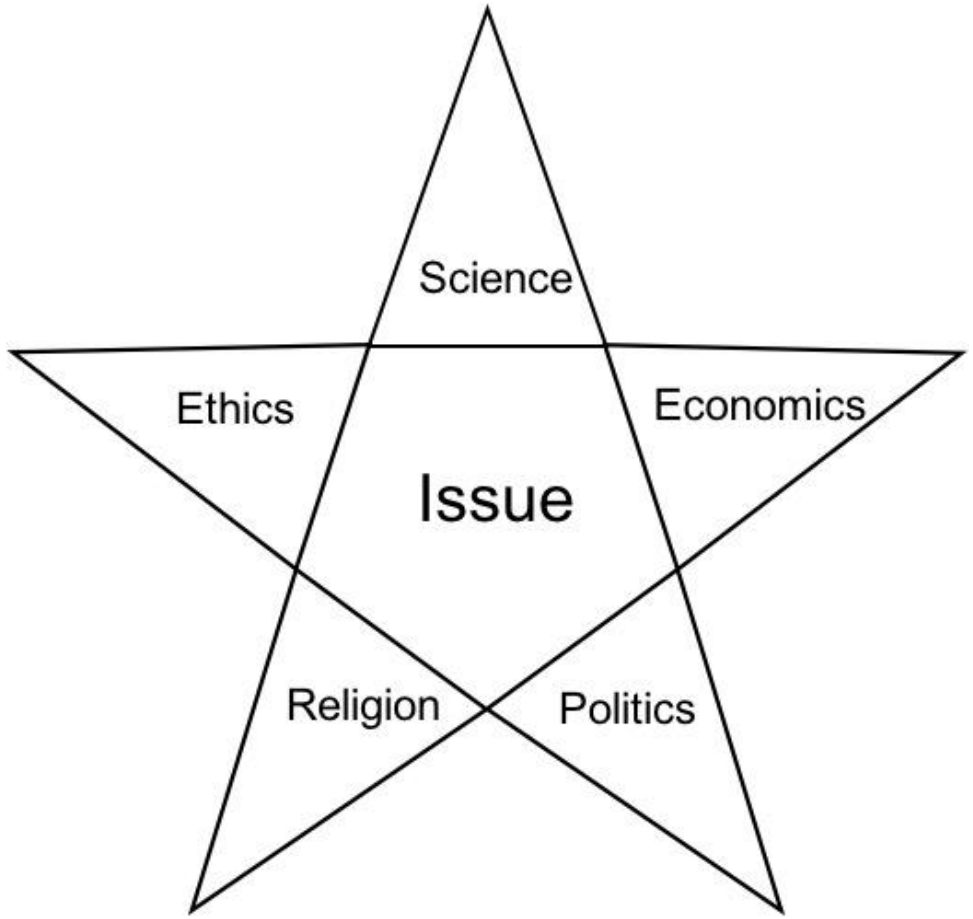
Illustrative Examples

“Getting to say what I wanted to say about this whole thing, like what age should I change it to and why, or just being able to, having the chance to have these really nice comebacks and ideas and being able to broadcast them, even if it's only to my teacher, like, just getting those ideas out there. I think that's really cool.” (agency)

“I can't stop the world from going around. I would love to stop crack, but I can't do that. But I mean just the little things, like just the people around me. I can be like, dude. Maybe if I was vaping – and I'm not – and my friend was like, ‘dude, like that's not really cool, or I don't want you to do that,’ maybe I would go, ‘maybe I should stop it.” (social responsibility)

Findings – Appropriations of the Epistemic Tools

- 1. lack of appropriation
- 2. appropriating the surface features
- 3. appropriating the epistemic purposes



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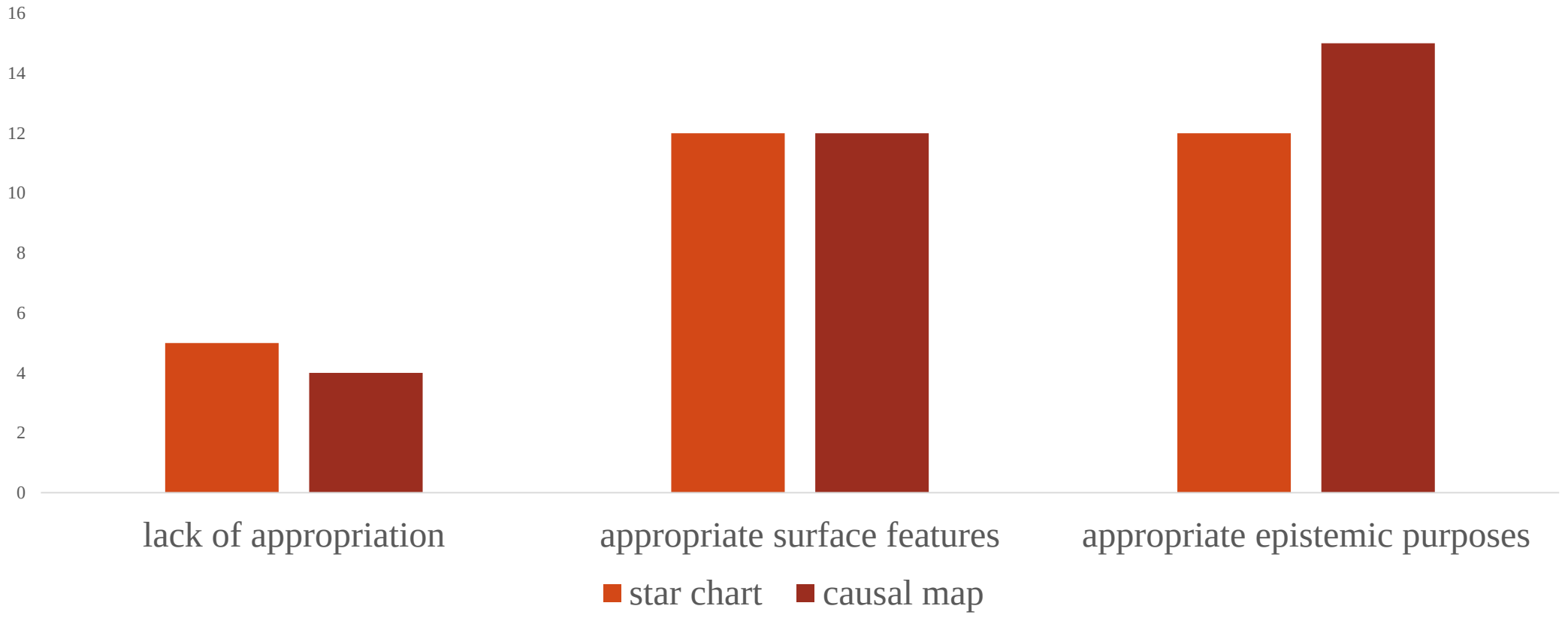

Illustrative Examples

- "It definitely was a great compilation of facts I guess is the best way to put it. Like for example, the accumulating project that we had, I basically got all my information and referenced everything from the star chart, particularly, the one that Mr. W posted on our page which was just like a compilation of everyone's and that was definitely a big major help for sure." (appropriating surface features)

- "Going back to the star, I saw more of the economic side and like how vaping has increased throughout like in the past years and how money has been coming in. I also saw that more of culturally and then, now, I understand why people vape and stuff like that. It's just like the star concepts, I learn more of vaping." (appropriating epistemic purposes)

Implications

- The culminating projects is a critical aspect of SSI teaching and learning
  - Students can leverage their interests in other subject matters/disciplines
  - Meaningful contexts for students to appropriate the epistemic tools

- Teachers' framing of the goal of the SSI tasks/activities is influence in how students take up the epistemic tools and SSI approach