Teaching with Sustainability

A course offered during IAP² January 2022

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Overview of Topics

Week 1- What is sustainability education?

- Defining sustainability using the Brundtland Report &sustainability education
- Brief timeline of education to accomplish sustainability initiatives
- Explanation of a Jigsaw Activity
- Jigsaw activity of foundational sustainability documents

Week 2 - What is effective teaching?

- Effective teaching is complex
- Learning theories provide a framework for how people learn
- Theoretical perspectives used in sustainability education
- Sustainability Learning Approaches
- Positivism vs Postpositivism
- Positivism and Postpositivism Activity
- Practicality of Sustainability Education

Week 3- How do we teach sustainably?

- Asset vs Deficit Approaches
- Criticism of US Education
- Bloom's Taxonomy
- Sustainability education looks to paradigm shifts
- Levels of implementing sustainability
- Level 1, Level 2, Level 3
- Transitioning through Sustainability Levels

Week 4- What does this look like for me?

- Explanation of Categories of Sustainability Literacy Competencies
- Explanation of Sustainable Instructional Approaches
- Overview of Understand by Design (UbD)
- Modified UbD template
- Sticking Points

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How do we teach sustainably?

Week 3

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Learning Objectives for Today

- Participants will be exposed to Bloom's Taxonomy
- Participants will explore education about sustainability, education for sustainability, and education as sustainability
- Participants will consider how this applies to their area of interest.

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Opening Activity

- Linking back to last week and thinking forward to this week, let's take a moment put these different activities on a continuum from least cognitively demanding to most cognitively demanding
  - **Investigation**: Proposing and conducting an investigation around a topic from class
  - **Quiz**: Completing a multiple choice quiz
  - **Presentation**: Giving a presentation about a specific topic
  - **Concept Map** Creating a concept map of topics learned in class
  - **Compare & Contrast** Comparing &contrasting different viewpoints
  - **Interview**: Interviewing someone about a class topic

A quick word on…

Asset vs. Deficit Approaches in Education

- Deficit Approach
  - Focuses on what students **can't** do.
  - If a student is struggling it is because the student is not trying hard enough
  - Can lead to low expectations of students

- Asset Approach
  - Focuses on what students **can** do, including strengths, skills, talents, and interests
  - Challenges assumptions that we may hold about students
  - Students rise to the challenge when they feel supported

What are some reasons that a student may be struggling that are not related to the amount they are trying?

Criticism of Education

- Education in the United States is often criticized for being a mile-wide and an inch deep.

- This leads students to a surface-level understanding of the content
  - Students learn material for the test
  - Students learn vocabulary and definitions but not applications
  - Students learn a lot of little things but not how they systematically connected

What are our goals?

How do we decide what to teach our students?

What are our goals for students?

How demanding and/or attainable are these goals?

How do we support students in achieving these goals?

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Bloom's Taxonomy

- 1956- Benjamin Bloom presented a taxonomy that allowed for the classification of the cognitive demand of learning objectives
- In theory, students move up each level of the pyramid as they build their understandings and teachers can facilitate this growth

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Scaffolding

- Scaffolding is used to build and provide support to students.
- Often the building is from concrete ideas to abstract ideas
- This can be done during on multiple scales when you are an instructor
  - Responding to a student question
  - Building an idea through a class period
  - Building to abstract ideas in a course
    - You can’t just jump into the deep end!

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Bloom's Taxonomy

- 2001 Bloom's Taxonomy was revised
- Replaced nouns with verbs were swapped to better identify the actions at each level
- Top two levels are swapped leading to the application of knowledge into something new as the most important in learning

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Bloom's Taxonomy

If nothing else, Bloom's Taxonomy gives us a common language to think about how we can increase the rigor or cognitive demand of our lessons with our students.

For many teachers this moves the conversation past rote knowledge into how students are engaging with the information they are learning.

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Sustainability Education

Sustainability education looks at ways to **transform systems of thinking and learning** .

Looking to shift and/or transcend the paradigms of our learners (Meadows, 2008)

There is a time and place for knowledge transfer in school settings, however, if the goal is deeper-level thinking, which leads to transformation, then this likely will *not* occur with surface-level learning

Time and place for everything! Teaching is about choices.

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Sustainability Education

- Sustainability Education is no stranger to the conversation about cognitive demand.
- Research has pointed to much of sustainability being covered at a surface-level, if at all, in many learning environments (Cortese, 2003; Everett, 2008; Sterling, 2011)
- Potter-Nelson Studies

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Sustainability Education

- Sterling discusses paradigm shifts in the guise of transformative learning experiences using the terms:
  - First-Order: Change in thinking
  - Second-Order: Change in Behavior
  - Third-Order: Epistemological Change

Sustainability Education

Table 1. Levels of implementing sustainability curricula in HEIs

Level		Type of ESD	Description	Pedagogical Approach
high/ very strong	redesign	education *as* sustainability	-holistic change and paradigm shift that places sustainability principles, ethics, and values at the core of the curriculum requiring the engagement of the whole person and institution -ESD is integrated into common core requirements and/or the vision of the HEI	emancipatory & transformative (third-order learning)
middle/ strong	„build-in"	education *for* sustainability	-significant changes to the curriculum by including a coherent coverage of content, values, and skills associated with sustainable development and a critical questioning of assumptions -sustainability is addressed in (interdisciplinary) programs/courses focusing on integrating sustainability issues -first linkages from ESD modules to other HEI areas such as operations/campus	
low/ weak	„bolt-on"	education *about* sustainability	-leaves current paradigm change unchallenged -sustainability concepts are added to specific disciplinary existing courses or programs (content based sustainability literacy) -minimal effort from the institution	instrumental & simplistic (first-order learning)
very weak	denial	no change	/	

Adapted from Sterling (2001), Sterling and Thomas (2006)

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Weiss, M., Barth, M., Wiek, A., & von Wehrden, H. (2021). Drivers and barriers of implementing sustainability curricula in higher education: Assumptions and evidence. *Higher Education Studies, 2*(2), 42-64.

Bold Goals

- Moving from a Level 1 to a Level 2 is BIG
- Arguably, it is an even bigger shift to move into a Level 3 from an instructional standpoint..

- You have to start somewhere!

Small changes lead to big impacts.

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What does this look like in practice?

Level 1- Education about Sustainability

- Providing examples that are linked to sustainability, climate change, and the environment in problem sets and other worksheets (link)
- Mentions during lectures about sustainability, climate change, and/or the environment (link)
- A paper or other writing about how a specific sustainability technology works or affects people (link)
- Students giving presentations about specific topics, policies, ideas (link)
- Listening to podcasts on topics about climate change, sustainability and/or the environment

Not bad! If the goal is increased cognition, then any of these examples, without reflection, means that students may not notice the link to sustainability!

What does this look like in practice?

Level 2 - Education for Sustainability

- Experiential learning about the content
  - Creating a school garden (link)
- Interdisciplinary papers, projects and presentations
  - What are the consequences of this? How will this affect other people?
    - Geoengineering Term Project (link)
- Student reflection and interaction on any of the lessons from Level 1
  - Problem sets that encourage reflection
  - Presentations/Final Assignments
- Side conversations with students

Often takes more instructional time to implement and needs to be intentionally scaffolded. Likely will occur later in a course.

What does this look like in practice?

Level 3 - Education as Sustainability

- Level 3 changes are hard to “measure” without conducting interviews of instructors and/or students.
- Instructors can set the foundation for a transformative change
- Some argue systemic change is necessary

- Some students may reach transformative changes with Level 2 Projects
- D:Lab Project (link)
- Multi-step Teacher Research Project
- Thermodynamics w/o combustion engines

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Transitioning through Sustainability in Classroom Activities

Original Activity	Level 1	Level 2	Level 3
Students are working to understand reaction rates in chemistry using a generic chemical equation and scenario.	Instead of using a generic equation, instructors have re-centered the problem around the chemical equation for smog	Faculty add an additional question after student complete their calculations asking them to reflect on or expand on the social impact of their calculation	Students engage in hands-on data collection around smog in local communities and analyze in conjunction with calculations

Transitioning through Sustainability in Classroom Activities

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Students write a one-page reaction piece to a content area reading.	Students write a one-page reaction piece to an environmentally focused content area reading.	Students are asked to write a one-page reaction/reflection piece on how their behaviors will change, if at all,	Students are asked to temporarily change their behavior(s) based on what they read and respond to how it affected them

What are our goals?

How do we decide what to teach our students?

What are our goals for students?

How demanding and/or attainable are these goals?

How do we support students in achieving these goals?

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Sustainability Education - Reminder

- Sustainability scholars would argue that the goal is transformative learning in all cases
- Pragmatically there are different ways to approach sustainability, climate change and the environment in how you teach

Great!

But…

I have so much to teach already, how do I add in one more thing?

- *Sustainability should not become an add-on to your already full curriculum.*
- *Find places where your instruction already supports sustainability and be intentional about growing your practice from there.*

Great!

But…

Is sustainability or climate change in my content standards?

- *You may not find the words* climate *or* sustainability *in your content standards.*
- *The skills that you wish to build such as critical thinking, creative thinking, clear communication, analyzing information, and using evidence, are all key skills that support building sustainability literacy in students.*
- *Sustainability looks to build knowledge, skills and dispositions for students in the areas of sustainability, systems thinking, social justice, futures thinking and active citizenship.*

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Where does it fit?

Categories of Sustainability Competencies	Sustainability Instructional Approaches
▫ Sustainability Knowledge ▫ Systems Thinking ▫ Social Justice ▫ Futures Thinking ▫ Active Citizenship ▫ Content Knowledge	▫ Collaborative, Small Group Learning ▫ Inquiry-based Learning ▫ Experiential Learning ▫ Service Learning ▫ Place-based Learning ▫ Culturally Sustained Learning

Pause for Pedagogy

A. Padlet
B. Zoom Questions

- What were strengths of these activities?
- What were barriers in these activities?
- What are ways that we could have more fully embodied sustainability in this lesson?

Going Further

Articles that address topics from class today:

- Weiss, M., Barth, M., Wiek, A., & von Wehrden, H. (2021). Drivers and barriers of implementing sustainability curricula in higher education: Assumptions and evidence. *Higher Education Studies, 11*(2), 42-64. https://doi.org/10.5539/hes.v11n2p42

- Paris, D. (2012). Culturally sustaining pedagogy: A needed change in stance, terminology, and practice. Educational Researcher, 41(3), 93–97. https://doi.org/10.3102/0013189X12441244

- Sterling, S. (2011). Transformative learning and sustainability: Sketching the conceptual ground. *Learning and Teaching in Higher Education, 5*, 17-33.

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Preview of Next Week

- Next week please have on hand the resources that you need to (re)vision an activity that you teach or hope to teach to be more sustainable
- We'll go more in detail on the framework
- You'll have time to work and share ideas with each other
- You'll be able to share out what your tentative plan to the large group

Review of Learning Objectives

- Participants will be exposed to Bloom's Taxonomy
- Participants will explore education about sustainability, education for sustainability, and education as sustainability
- Participants will consider how this applies to their area of interest.

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1. What did you learn today?
2. How will people you interact with know and benefit?

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