On the complexities & possibilities of ICT education for sustainability

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Who am I?
Navigating Computing

(Peters, Rick 2014)
Researching Computing Education

(Peters 2017, 2018)
Navigating contexts
Educational transformation for sustainability

Anne Peters
Marie Magnell
Björn Kjellgren
Linda Söderlindh
Tanja Richter

Anders Rosén

Björn Hedin
Lotta Dehlin

Marcus Angelin & House of Science
Annica Gullberg

Susanne Engström
Kristina Andersson

School Teacher Education
Where are we in terms of sustainability in computing education? What more could we do? How does this speak to you?
Analyse 90 relevant studies for:
1) conceptions of sustainability, computing for sustainability, and education,
2) implementations of sustainability in computing education
3) research on sustainability in computing education.
Results
Sustainability in Engineering Education

Examples of added topics and attributes:

- Scenario construction, forecasting, backcasting and visioning
- Operating within planetary boundaries and social foundations for human societies
- Power, politics, authority in strategy building and change

- Design for sustainability:
  - Life cycle perspective
  - Circular economy
  - Systems perspective including environmental, social and economic aspects
  - Efficient and reduced use of energy, materials and land
  - Reduce/eliminate environmental impact
  - Reusability, remanufacturing, recycling, retirement

(Malmqvist et al, 2022)
Sustainability Key Competencies

**LfS Core Competency Framework**

- **social skills & agency**
  - Implementing transformative change
  - Modeling of sustainable behaviors
  - Wise, compassionate decision making
  - Empathy, mindfulness, and social learning

- **knowledge & understanding**
  - Integration of tradition with future thinking (broad & long view)
  - Systems thinking and dynamics (interconnectedness)
  - State of the planet literacy and numeracy

- **values & commitments**
  - Commitment to the common good and affinity for all life
  - Cares and interests of others
  - Cares of and for the self

*competencies build developmentally, upwards from root to fruit*

(Pacis & van Wynsberghe 2020, Wiek 2011)
Results

- Little on drastic systemic change
- Little connection to critical theory
- >50% experience reports
- Mostly describing modules
Interview Year 1: “The connection between computer science and political science comes naturally.”

Interview Year 3: ”I think, one misses a lot when combining politics and CS. [...] Political science [...] is about discussion [...] without getting anywhere. [...] The only way to come to a point of right or wrong is to look at reality. In CS, it often feels like ”I want to do a better solution”. One tries: Can I do this algorithm slightly, slightly faster? As this is a theoretical, a natural science discipline, one can always test the solution [...] in a very small, secure environment.”

(Peters 2017, 2018)
Participation in CS/IT is experienced as...

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Finley (IT, year 3): When you have managed to divide the problem into parts and merge the small solutions, and when you in the end have created something that seems to give the result that you were aiming for, when you realise that this can work, then I feel 'This is fun!' and then you become a junkie - that you want to feel this feeling again and again. And then you work towards that feeling that can exist in other situations as well.
Participation & competence development (2)

Participation in CS/IT is experienced as...

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Amari (CS, year 3): “We have this bible, […] a thick book which contains a lot of algorithms […] and data structures. […] it is very complete, […] it contains only necessary text.

I: “How did you use it?”
Amari: “[…] The book contains a list of different algorithms that you can go through to see: ‘That algorithm is suitable for this problem!’.”

I: “How did the book get the name bible?”
Amari: “[…] Older students have called the book ‘the bible’, because for many students, CS is all about algorithms and data structures.”
Marginalisation

Chris (CS, year 3): “The teacher [of the HCI course] was very interested in HCI. [ . . . ] We thought: ‘He is not a real computer scientist!’ (laughs) But then it turned out that he actually could program and that he was as good as we are, [ . . . ] just that he had an interest in that which was a bit fuzzy.”
Among feminist critiques [...] a recurring line of argumentation is that the engineering curriculum is reductionist, that is, privileges contextless and abstract knowledge over the situated and the context-bound. This is often explained by highlighting how engineering education is narrowly focused on mathematics and technology and modelled on the natural sciences”

(Ottemo, Berge, Silfver 2020)
Calls for reimagining tech since long!!

“We revere that which is defined as ‘rational’ as distinct from that which is judged ‘emotional’. We are no longer sure whether science and technology are the solution to world problems.”

(Wajcman 1991)
... a common thread that emerges across the reviewed literature is the central role of power, manifest in many forms, from a dogmatic political-economic hegemony [...] to narrow techno-economic mindsets and ideologies of control
Education as an instrument of control

Education set up to maintain the system, to reach economic goals and ensure national competitiveness.

”Students can be viewed as raw materials in a production process or consumers in a market, not citizens nor human beings.”

(Mendick and Peters 2022)
Are we still living in the Anthropocene?

The subject of the pedagogical test lecture is “Recursive algorithms”
Education as “pig farming”
Responses?
“The master’s tools will never dismantle the master’s house.”
(Audre Lorde, 1984)
Relationality with the computer

Teacher: ”I am a nerd and I get paid. I am doing programming languages. That is my super nerdy thing. Why should you learn programming? It is fantastic to do programming, it is fantastic to be able to programme. A computer is a good gadget. Does humanity need it? Doubtful. But why not?”

Teacher: “Programming is like story telling [...] One can be ‘carried away’.

Teacher: “Who sees the mistake? (pause) Those who do, perhaps have programmed before and see it easier, because they feel it in the whole body.”

(Peters, Bengtsson, in review)
Embrace emotions

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N=65

(Eriksson, Peters, Pargman, Hedin, Laurell-Thorslund, Sjöö 2022)
Education as care, transformation, emergent

- From "education as preparation", training, to education as transformation
- Unique potential of education as a democratic domain
- Care in affective relationship

Taking Care of the Future?
The complex responsibility of education & politics

Deborah Osberg

In one way or another, all the essays in this volume address the question of how it is possible to take up an affirmative orientation to the future when, as Paul Cilliers writes in the foreword to this volume, “we have to make choices which cannot be reduced to calculation alone.” If we care about the future, it matters very much that we do the “right” thing... it is important that we act in a way that will indeed positively influence the future, rather than that we act in a way that will have a negative effect or that we refrain from acting at all (which is nevertheless still taking a position that can have a negative effect). But if we can no longer know, in rational or calculable terms, what the “right” thing may be, then how should we act? What should we do? Under these conditions what is the meaning of normativity? How do we make sense of “should”? In this final essay I argue for the necessity to engage, in complex terms, with the question of how it is possible to adopt an affirmative orientation to the future. I use the politically and ethically
“This report recognises the value of diverse forms of knowledge such as scientific, as well as Indigenous knowledge and local knowledge"
Radical futurity

• Convene around anticipatory emotions
• Engage with the paradox of sustainability & computing as emergent
• Attend to norms, values, power
From “education for sustainable development” to “education for the end of the world as we know it”

“We contend that the predicament we face is not primarily rooted in ignorance and thus solvable with more knowledge, nor primarily rooted in immorality and thus solvable with more normative values; rather, it is rooted in denials that stem from harmful desires for and investments in the continuity of the securities and satisfactions promised by modernity-coloniality”

(Stein et al. 2022)
Thank you for listening!
Please reach out!! To Anne Peters: akpeters@kth.se

1. **Sustainability in computing education today?**

2. **What more could we do?**
   Education as care, transformation emergent, radical futurity

3. **How does this speak to you? E.g.**
   Examples of education as transformation? Reflections on the “computar-cene” & education?
References


