

# EKSTERNE LÆRINGS MILJØER

...deres rolle og værdi for undervisning i bæredygtighed

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beskrivende

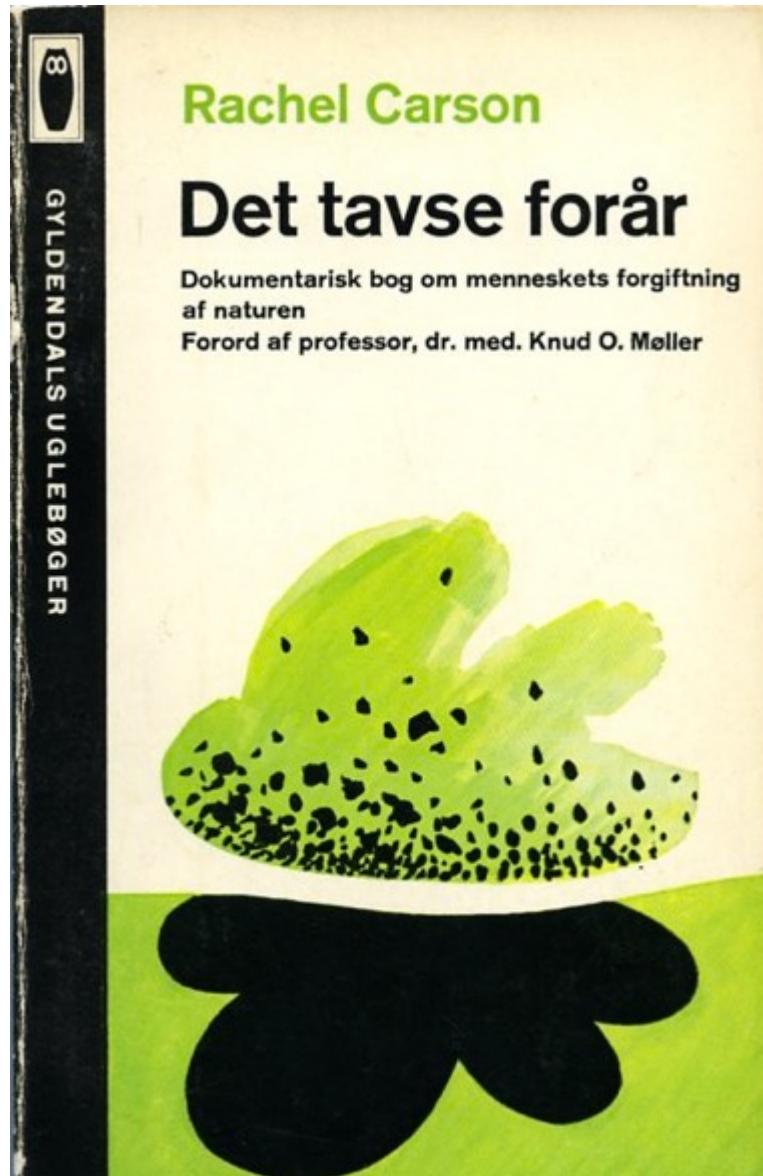
**sørgelig**

**bevægende**

fortidens fortælling  
stærke indre billeder  
fabel eller fakta  
gamle problemer  
stemningsfuldt  
foruroligende  
storhed  
aktuel  
autentisk  
vemon  
afslapning

tristesse

tankevækkende  
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uro  
smuk  
trist  
dyster  
uhyggetligt  
kulde  
ting bedre i gammel tid



## Rachel Carson (1963). *Det tavse forår.* Gyldendal

Carsons bog var en øjenåbner, og dens betydning for 1960'ernes spirende miljøbevægelse – og for nutidens natursyn – er svær at overdrive.

Det tavse forår, som Carson skrev om, var et forår uden fuglesang – et forår, hvor udbredt brug af DDT i landbruget havde ødelagt levegrundlaget for alt fugleliv.

Det tavse forår blev dermed en metafor for menneskets misforståede tillid til den teknologiske beherskelse af naturen.

Tekstens spekulative og følelsesmæssige egenskaber, og dens forsøg på at skabe et tankeeksperiment om verdens undergang på grund af forurening, førte til at den blev afvist af forskere i sin samtid som triviel og fantasifuld fiktion

**Men disse egenskaber fremhæves i dag som tekstens retoriske kraft og dens grad af nuance**



Hvordan kan  
\*æstetiske metoder  
bruges til at engagere  
børn, unge og voksne i  
bæredygtighed?

# Modus 1

# Modus 2

# Modus 3 ?

Kvantitative metoder	Kvalitative metoder	*Æstetiske metoder
Tal	Ord	Fortællinger, billeder, lyde, scenarier, andre sanse-input
Data opdages	Data indsamles	Data eller indhold skabes
Måling	Mening	Vækkelse eller fremkaldelse
Validitet	Fortolkning	Sandfærdighed
Bevis	Bevis	Overbevisningskraft
Generaliserbarhed	Overførbarhed	Genklang
Monofaglighed	Flerfaglighed	Tværfaglighed



Article

## Strengthening Sensoriality in Sustainability Science—Theoretical and Practical Implications

Harald Heinrichs

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132

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**Abstract:** Sustainability science has traditionally focused on the integration of different forms of knowledge. Despite significant methodological diversity, the dominant mode of knowledge production, representation and communication in transdisciplinary research is, however, quite traditional: it is based on gathering data followed by a text-based scientific argumentation. In recent times, arts-based and sensory approaches in social and cultural sciences have been employed to avoid scientific reductionism and gain more holistic insights into human experiences. The potential of arts-based research for opening up new ways of knowledge production and communication in sustainability science should be seized.

Harald Heinrichs

**Keywords:** sensoriality, arts-based research, sustainability science, transdisciplinarity

## RESEARCH

Volume 16 Number 10 December 2021

## Sustainability Science with Ozzy Osbourne, Julia Roberts and Ai Weiwei

### The Potential of Arts-Based Research for Sustainable Development

*Transdisciplinary sustainability science is focusing on the integration of different forms of knowledge. Despite significant methodological diversity, the dominant mode of knowledge production, representation and communication in transdisciplinary research is, however, quite traditional: it is based on gathering data followed by a text-based scientific argumentation. In recent times, arts-based and sensory approaches in social and cultural sciences have been employed to avoid scientific reductionism and gain more holistic insights into human experiences. The potential of arts-based research for opening up new ways of knowledge production and communication in sustainability science should be seized.*

Sustainability Science (2021) 16:1875–1889

Hujala, T., et al. (2021). Youth Inclusion in Forest Policy Dialogue: Contemplating Human–Forest Relationships through Arts-Based Methods. *Rural Landscapes: Society, Environment, History*, 8(1): 4, 1–16. DOI: <https://doi.org/10.16993/rlh.69>



## Youth Inclusion in Forest Policy Dialogue: Contemplating Human–Forest Relationships through Arts-Based Methods

ful forest policy participation. However, people, hamper youth inclusion in policy practices that nurture human–forest methods, such as photography, music, or exploiting such methods requires better two cases where young people (17– prospective reflections, we qualitatively innovation workshop blending art and environmental and forest scientists. Case hip-hop/rap video about laser scanning participants' reflections. Analysis applied behavioural dimensions. The workshop is coupled with unequal participation

and sustain-  
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ploratory  
to identify  
practices  
key areas  
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untapped  
ISI)

# Æstetiske metoder i bæredygtighedsformidling

Forskellige  
videnstyper

Deltagelse  
og inklusion

Science in  
the making



## Adskillelseslogik og mekanisk tænkning som grundlæggende problem

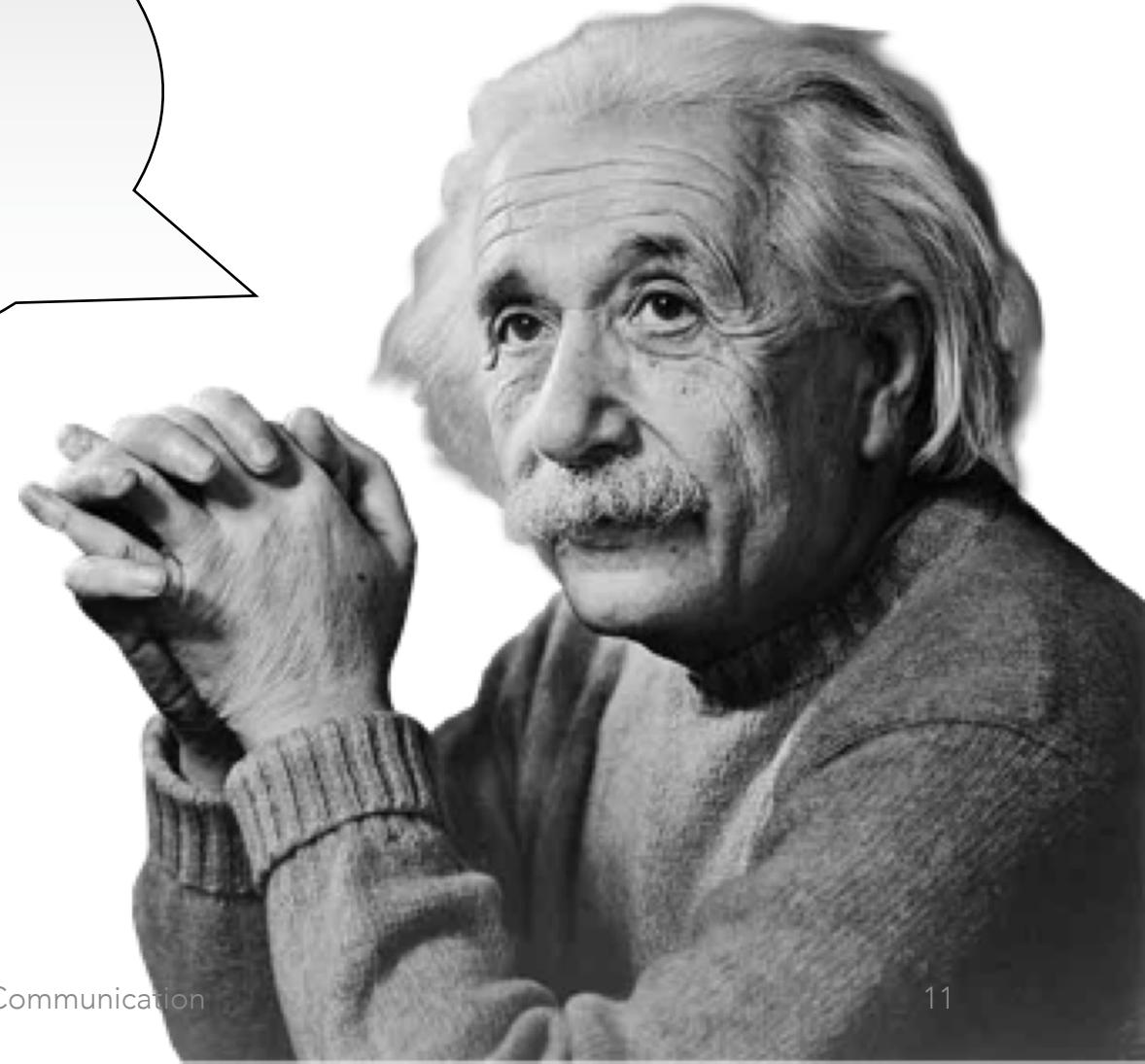
...vores moderne samfund har fremelsket en **adskillelseslogik** som gennemsyrer vores måder at tænke og begribe os selv og verden på, og vores organisationsformer og teknologier...

På det videnskabelige område er der sket en opsplitning i fag, som har delt og sorteret deres objekter i adskilte enheder, hvis sammenhænge er blevet reduceret til simple årsag-virkningsmekanismer...

**Det gælder i særdeleshed naturvidenskaberne, som derved har bidraget til udviklingen af et opsplittet og rent teknisk syn på naturen.**

Læssøe 2020: 108-109

*a problem cannot be solved by the same mindset that helped create it*





Positioning climate change as a phenomenon to be known primarily through science has led to approaches to public engagement that are highly disengaging , as well as ignoring the emotional pain of those who are already concerned

Verlie 2022

<https://www.theguardian.com/australia-news/2020/jan/24/australian-bushfires-to-contribute-to-huge-annual-increase-in-global-carbon-dioxide>



These five geodesic domes each contain carefully created environments, simulating different atmospheric conditions globally. Visitors begin in Tautra in Norway, breathing in clean smelling air and then continuing through to the cities of London, New Delhi, Beijing and São Paulo which between them suffer from some of the lowest air quality in the world.



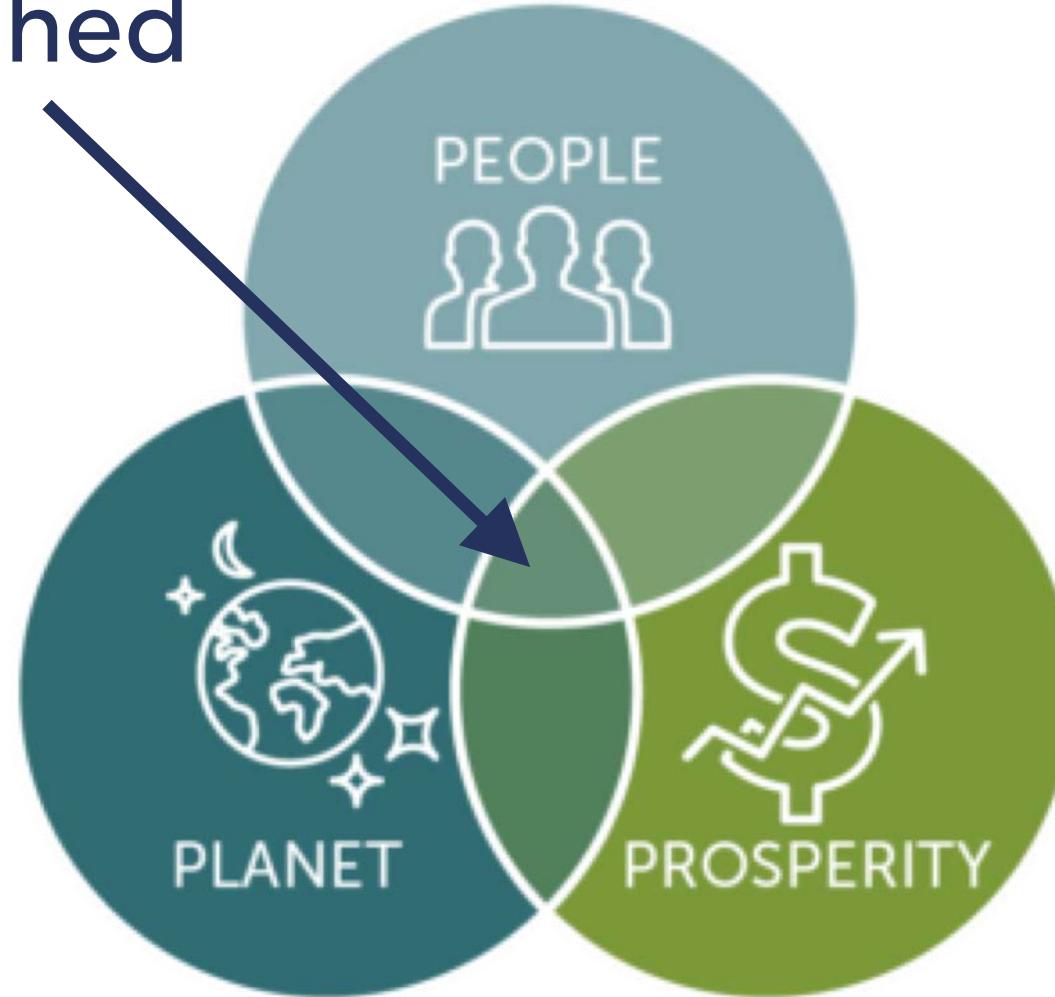
Spectacular effects are used to show the causes and effects of global warming. The floor is covered with 10 cm of water to illustrate the effect of increasing sea level. The visitors experience drops falling from the roof, water vapour, airflow and water currents.

# Æstetiske metoder i bæredygtighedsformidling

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videnstyper

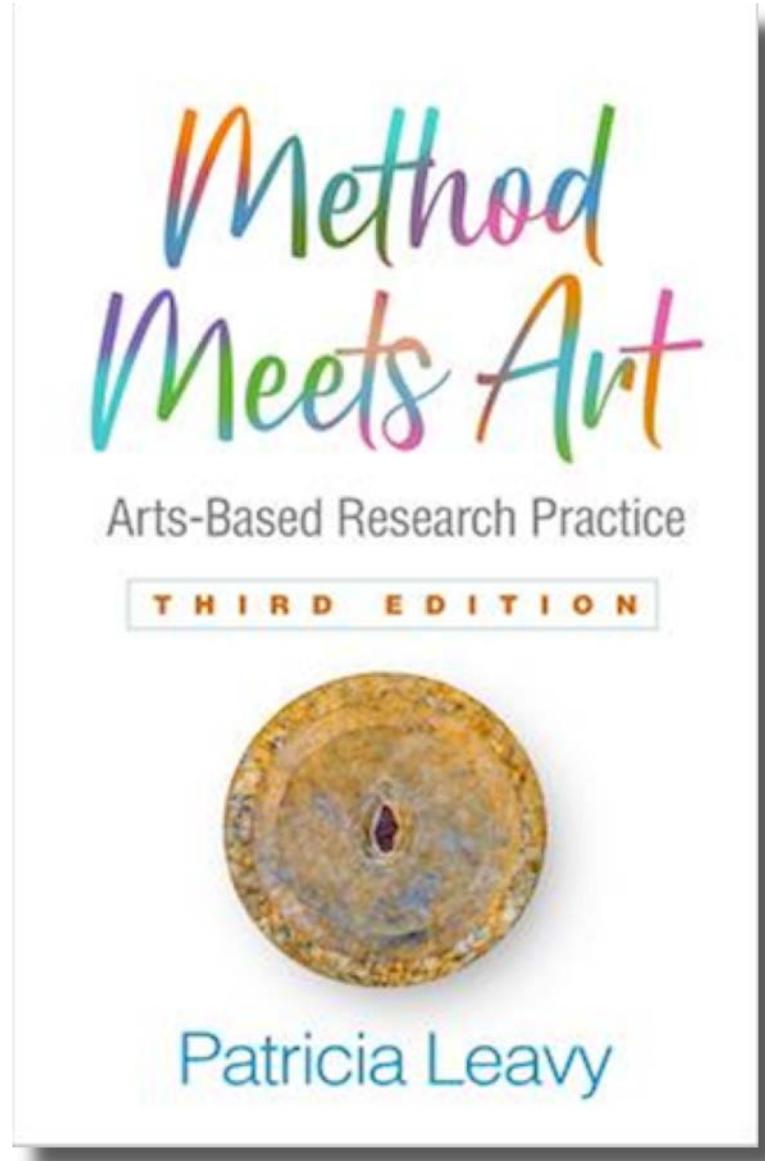
Deltagelse  
og inklusion

# Bæredygtighed





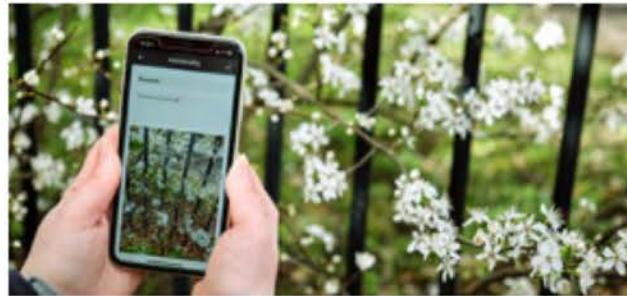
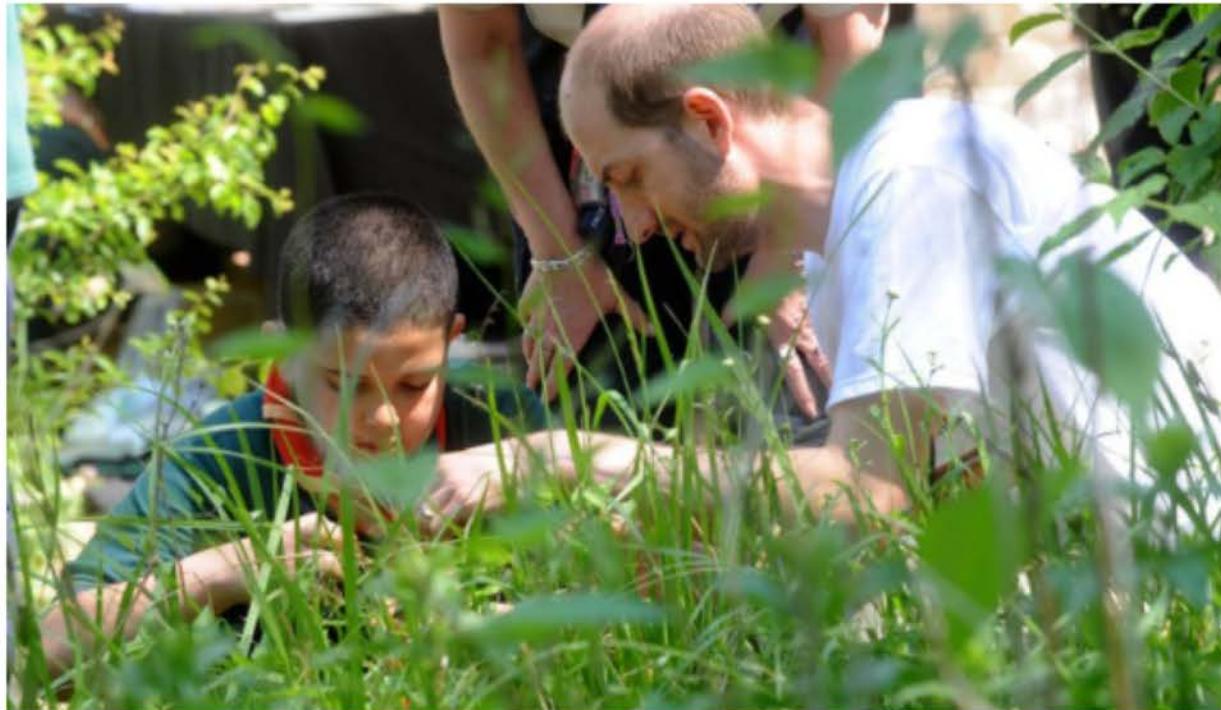
The problems that scientists and engineers have usually focused upon are mostly “tame” or “benign” ones. **Wicked problems**, in contrast, have neither of these traits. Would-be solutions are confounded by dilemmas posed by the growing pluralism of the contemporary publics [...]



In arts-based research, when non-academic stakeholders are involved, they are viewed and valued as full, equal collaborators, thereby crumbling the traditional researcher-researched hierarchy.

By connecting people on emotional and visceral levels, artistic forms of representation facilitate empathy, which is necessary for building community across differences.

# Citizen science



## Digital nature journal

Whatever you've seen, our digital nature journal gives you a free and easy way to keep track of it all.

Answering the big science questions around climate change and the diversity of life requires lots of data, and our researchers can't gather this alone. You can help.

Tweets by [@NHM\\_CitSci](#)

 Citizen Science at the Natural History M [@NHM\\_CitSci](#)  
Did you know it's [#WorldNatureConservationDay](#) on 28 July?

# Citizen Science

**Alle kan hjælpe med at forske i den danske natur på Statens Naturhistoriske Museum**

Citizen Science-projekter er videnskabelige projekter hvor du inviteres til at hjælpe med at forske. Forskningen kan være inden for forskellige emner, ligesom det også vil være forskellige måder, du kan deltage på.

Læs mere om vores Citizen Science-projekter herunder, og find ud af hvordan du kan blive en del af dem.

Del din viden om naturen i Danmark +

ARTER



Lær naturvidenskabelige metoder +

NEXT GENERATION LAB



A  
Samler

PULS udstillingen blev samskabt af borgere, sundhedsforskere og designere



Experimentarium 2017  
Sandholdt & Achiam 2018

# Æstetiske metoder i bæredygtighedsformidling

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the making

...the involvement of extended peer communities, not only in dissemination of research results, but also in **the research process itself**.

[...] in a knowledge society knowledge is dispersed and cannot be monopolized by a single group, in this case the scientific system and community. Thus [...] the sources of intelligence are extended to include non scientific knowledge, **the research question is defined together**, and the quality of the work is checked by both groups, as those affected are the experts for relevance, while scientists are the experts for rigour

disciplinary-based science for sustainability, transdisciplinary science of sustainability. Whereas the former consists of more descriptive, analytical and basic science, the latter is characterized by reflexivity and applicability; on a meta level, the emergence of the latter can be understood as a new step in the evolution of science. This review provides an overview of the state of sustainability science,

Sustainable development is a global development concept giving overriding priority to the satisfaction of human needs, in particular of the global poor, while respecting environmental limits (WCED [World Commission on Environment and Development], 1987). The International Union for the Conservation of Nature (IUCN) et al. (1991) defined it as the capacity to maintain a certain process or state for improving

# Forskningsfronten og den etablerede naturvidenskab



Science fiction is here to prevent and invent the future. *Prevent* the future in the sense that science fiction can tell us the danger that the future holds for us, but it can also help us *invent* the future and make sure that the future is without those dangers





## Mød Midori, Kiro og Aka

Tre tidsrejsende piger fra tre helt forskellige fremtider. De er strandet her på Experimentarium, og du skal hjælpe dem hjem til 2121. Men hvilken fremtid kan de ende i? Det afgør du med dit klimaafttryk. Ender dit forbrug med at skabe Midoris grønne verden, Kiro's gule verden eller Akas røde verden?

I Midoris grønne fremtids-verden (1.5–2° stigning) har vi nået klimamålene, og verden er i bedre balance.

I Kiros gule fremtids-verden (3–3.5° stigning) er der knaphed på ressourcer, vi mennesker bor tæt og klimaet er ustabilt.

I Akas røde fremtids-verden (4.5° stigning) er øko-systemerne ved at bryde sammen, vandstanden er steget meget, og vi mennesker har måttet tilpasse os en hverdag med afsavn.

Experimentarium 2021



Ready Made Science



**Sustainability in  
the making**

# Æstetiske metoder i bæredygtighedsformidling



- Ligesom naturvidenskabelige metoder, søger æstetiske metoder at udvide vores menneskelige forståelse af verden.
- Men hvor naurvidenskaben ser verden ved at inddæle den i kvantificerbare dele, ser æstetikken verden på en helshedsorienteret, problem-baseret måde.
- Æstetiske metoder kan derfor konkretisere, kontekstualisere og kondensere abstrakte emner og komplekse problemer på måder der beriger naturvidenskabens monofaglige, kognitive formater.
- Eksterne læringsmiljøer er på mange måder ideelle rammer for udfoldelsen af æstetiske metoder



Morten Rask Petersen,  
Lars Brian Krogh og  
Jens Dolin stod for et  
Delphi studium, hvis tre  
runder blev gennemført  
i løbet af 2021

- Det er vigtigt, at bæredygtige problemløsninger ikke knyttes til en bestemt didaktik, og at **humanistiske** og **samfundsfaglige** vinkler inddrages i et fagligt samarbejde.
- Det er også vigtigt, at man ikke overfokuserer på tunge og upåvirkelige problemaspekter [...]. Her kan kobling med **Åben Skole** være produktiv, så eleverne kan opleve de **civilsamfundsmæssige** fællesskaber i den skolenære kontekst, som de kan blive en del af.
- Ligeledes efterspørges mere forskning i, hvordan der kan arbejdes konstruktivt med bæredygtighed, eksempelvis med udgangspunkt i **fascination for og kendskab til "naturen"** og dens processer.
- Ellers er der fokus på at aklare, **hvad der er/bør være naturfagenes bidrag** til elevernes forståelse og ageren ift. bæredygtig udvikling og grøn omstilling.

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