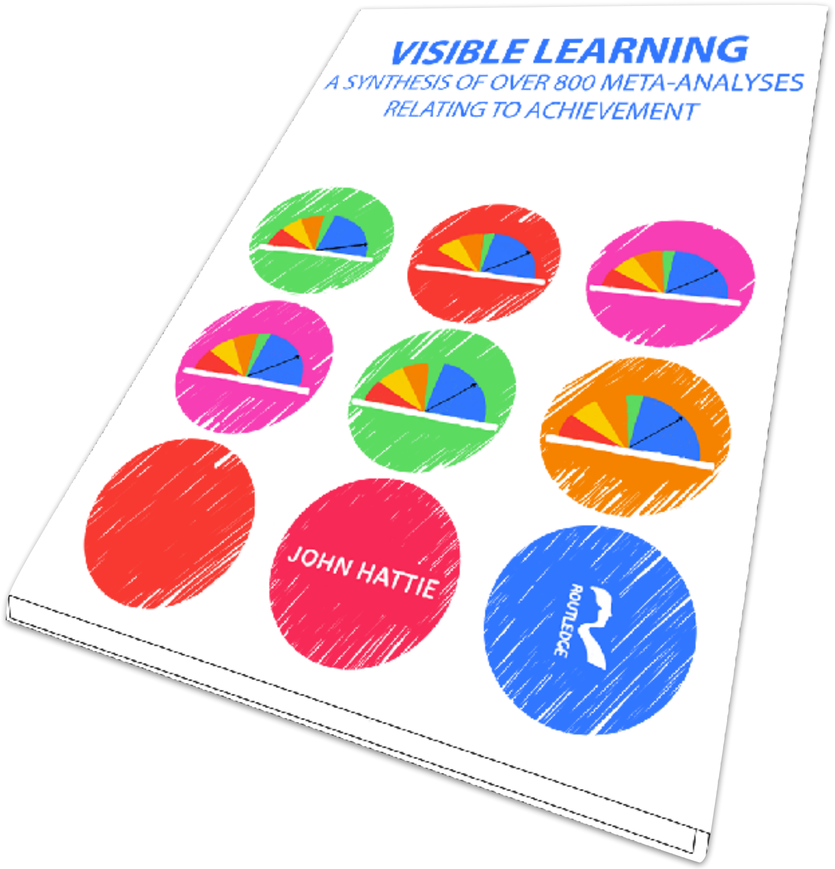
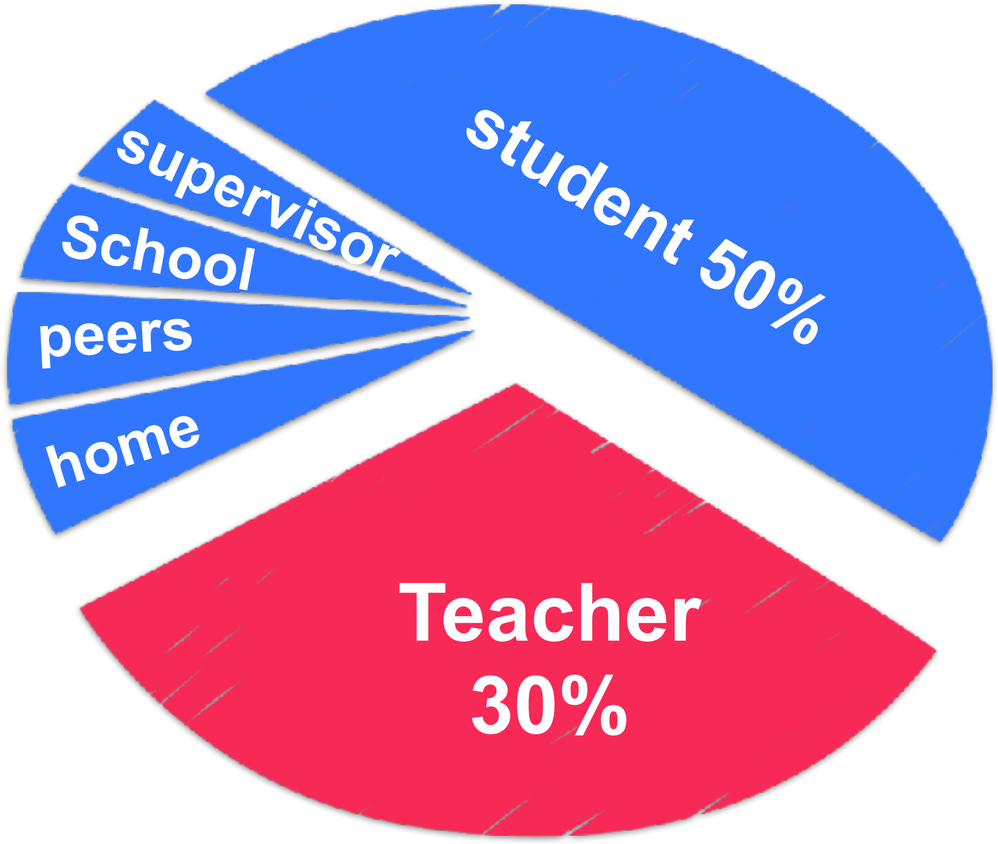
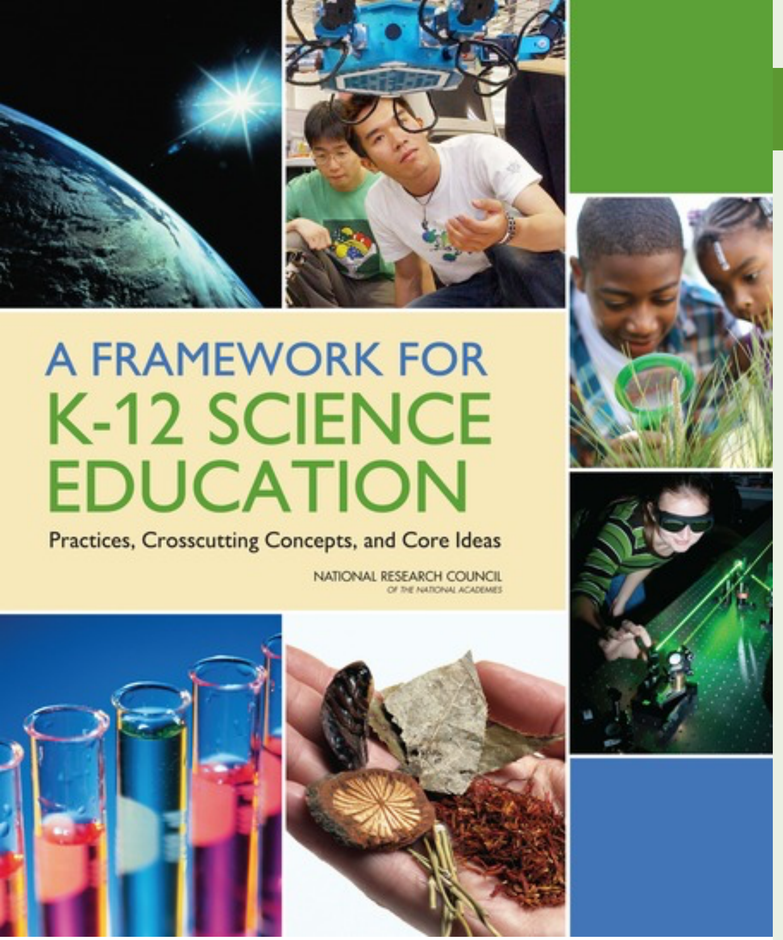
What we know from teaching sustainability

- environmental consciousness and pro-environmental behaviour do not correlate UBA (2016)
- school programs (sustainable/green/eco schools) can (in some cases) increase environmental knowledge but do not affect attitudes and routines.
  Hallfredotstir (2011); Krnel und Naglic (2009), Ozsoy (2012); Boeve-de Pauw & Van Petegem (2011); Legault & Pelletier (2000); Berglund, Gericke, & Chang Rundgren (2014)
- To affect students, their participation in the schools' decision making processes are crucial Cincera und Krajhanzl (2013)


VISIBLE LEARNING
A SYNTHESIS OF OVER 800 META-ANALYSES RELATING TO ACHIEVEMENT
JOHN HATTIE
ROUTLEDGE


student 50%
supervisor
School
peers
home
Teacher 30%



NEXT GENERATION SCIENCE STANDARDS
For States, By States

BOX S-1

THE THREE DIMENSIONS OF THE FRAMEWORK

1 Scientific and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

2 Crosscutting Concepts

1. Patterns
2. Cause and effect: Mechanism and explanation
3. Scale, proportion, and quantity
4. Systems and system models
5. Energy and matter: Flows, cycles, and conservation
6. Structure and function
7. Stability and change

3 Disciplinary Core Ideas

Physical Sciences

PS1: Matter and its interactions
PS2: Motion and stability: Forces and interactions
PS3: Energy
PS4: Waves and their applications in technologies for information transfer

Competences for Science (5-10)

Conceptual Knowledge
Lebewesen, biologische Phänomene, Begriffe, Prinzipien, Fakten kennen und den Basiskonzepten zuordnen

Nature of Science
Beobachten, Vergleichen, Experimentieren, Modelle nutzen und Arbeitstechniken anwenden

Communication
Informationen sach- und fachbezogen erschließen und austauschen

Socioscientific Issues
Biologische Sachverhalte in verschiedenen Kontexten erkennen und bewerten

Planetary Boundary	Curricular anchoring
Climate change	Interactions between electromagnetic radiation and matter, radiation spectra, stable states, equilibria, aerosols, isotopes , states of matter, stoichiometry, hydrocarbons, energy, thermodynamics, adaption, energy conservation
Ocean acidification	Acid-base chemistry, equilibria, solubility, stoichiometry, photochemistry, interactions between radiation and matter, radicals, chemical reactions, adaption, control and
Decreasing stratospheric ozone	Equilibria, stoichiometry, photochemistry, radicals, structure property relationships, catalysts, intermolecular interactions, radiation spectra
Nitrogen and phosphorus cycles	Material and energy conversion, kinetics, main group chemistry, stoichiometry, thermodynamics, chemical reactions, donor-acceptor reactions, biogeochemical
…	…

Textbook science	Frontier science
Discrete disciplinary borders	Inter/transdisciplinary
Social aspects only for motivational reasons	Knowledge should contribute to solving social problems
Knowledge is sure	Parts of knowledge are preliminary
static knowledge; established concepts and laws	assessing possibilities and probabilities; multiple solutions
Risk and uncertainty are not part of scientific reasoning	Uncertainty and risks are part of the solution

There is no excuse not teaching sustainability:

The planetary boundaries fit into every curriculum. We just need to change the perspective on our subject.

Literature:

Niebert, K. (2016). Nachhaltigkeit lernen im Anthropozän. In M. K. W. Schweer (Ed.), Bildung für nachhaltige Entwicklung in pädagogischen Handlungsfeldern (pp. 77–94). Frankfurt a.M.: Peter Lang.
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