



NOU 2015: 8 The Future of schooling

Renewal of subjects and competences





Key questions in the report

- Which competences will become important for the students in their school activities, in further education and work life, and as responsible citizens?
- Which changes are needed in the subjects in order for the students to be able to develop these competences?
- What are the demands for different institutions and actors in the educational system to insure that subject renewal will lead to in-depth learning?



Building evidence for learning

- What types of evidence?
 - Evidence at different levels – research designs and generalizations
 - Evidence in microstructures and interactions
 - Measurement, processes, abstraction - and the context
- *Aggregation and transformation of practices*
 - *Knowledge organizing*
 - *Differences:*
 - *Abstracting; sorting key factors*
 - *Integrated in sequences actions*



Using evidence for change

- What works – what is what and what does work means?
- 1=1
- Limitation – the boundaries
- The move from empirical results to normative assumption as guidelines
- What should we *not* do – from single studies to policy or systemic changes



Future learning

- Connecting multiple resources
- Interpretation of data (visual, figures, tables etc.)
- Scientific methods and ways of reasoning
- Critical thinking and reasoning and ethical considerations
- Problem solving in digital environments
- Knowledge integration as condition for becoming a involved and participating citizen
 - In-depth learning and learning progression



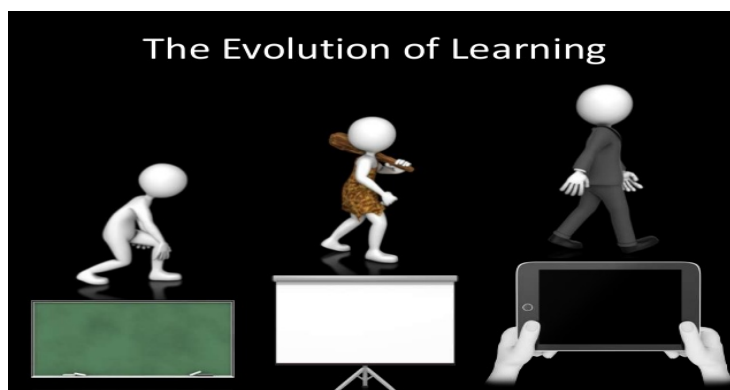


The need for subject renewal

- Deep trends in the society
- The knowledge foundation
- The objects clause for the Norwegian school system

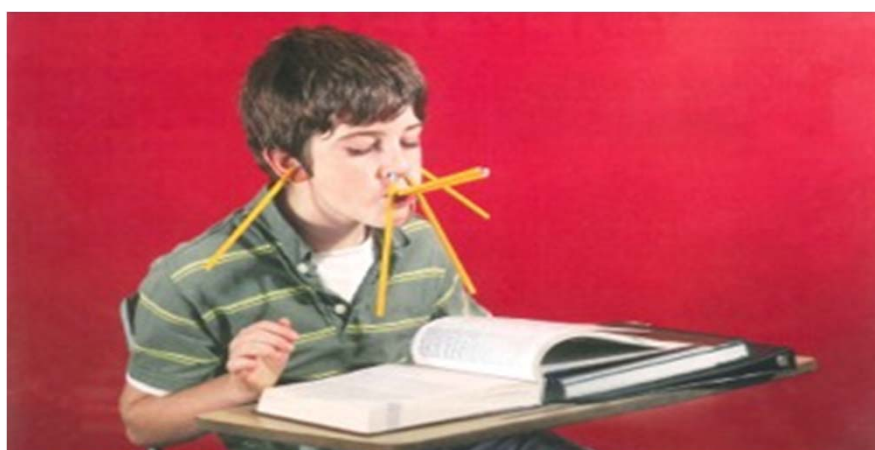


Learning metaphors





Multiplicity – students perspetices



Learning metaphors - Distributed cognition



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Curriculum overload

- Curriculum «A mile wide and an inch deep»
(Smith et al., 1996, s. 68)
 - Information overload
 - Inquiry takes too much time
 - Experiment is relevant, but one can't be sure if the experiences become transformed to concepts
 - Forms of assessment

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Building blocks in the subject curriculum

- Curriculum overload
- Increased weight on building blocks in the construction of the subject curriculum
 - Methods, ways of reason, concepts and conceptual systems principles and contexts

Design based research

- Designing for in-depth orientation
 - Hard-to-learn problems
 - Generative ideas and principles
 - Over several weeks

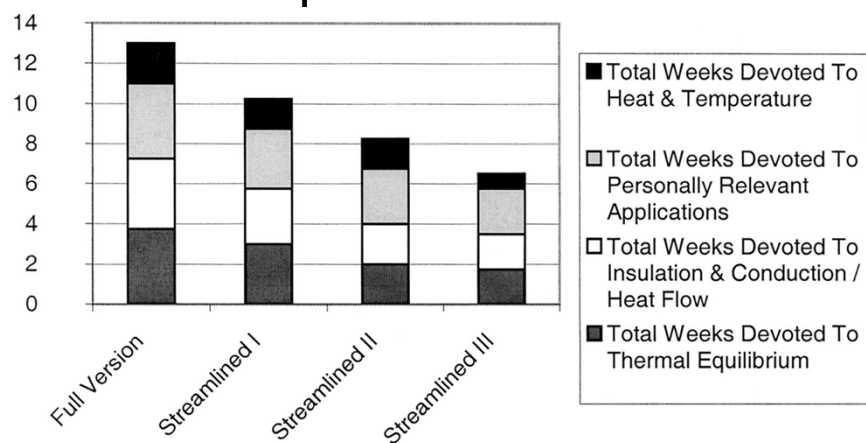
- What can time mean for learning concepts – within a conceptual systems
 - Problem: Overload with regards to themes – and relation between themes (prior knowledge, connecting, transfer)
 - Natural science
 - US 65 themes grade 8
 - Japan 5 themes grade 8
 - Norge – closer to the US than Japan

Deep versus surface

- Design (M. Linn et al)
 - 13 weeks
 - 10 weeks
 - 8 weeks
 - 6 weeks
 - Recommendation 1-2 weeks
- 3000 students – multiple choice, knowledge integration items and qualitative methods

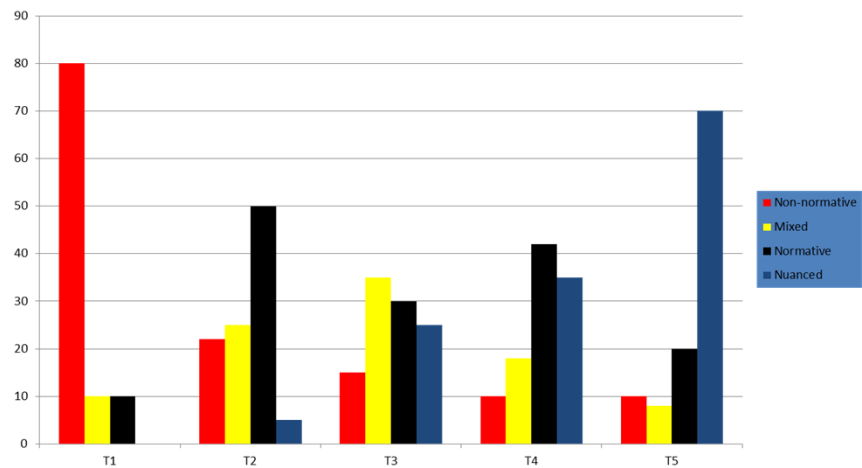
- Theme: thermodynamic
- Insulation, conduction and heat flow
- Heat, energy and temperature
- Thermal equilibrium

Deep versus surface



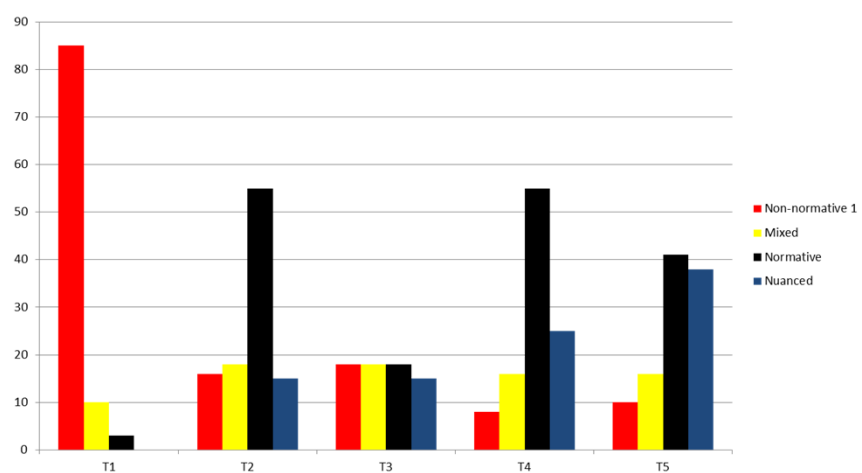
Deep versus surface

Heat, energy and temperature



Deep versus surface

Insulation, conduction and heat flow



Deep versus surface

- Summary
 - Study of one student
 - 12 weeks
 - 'Thermodynamics' – 70-90% of the students develops normative ideas within the themes
 - Reduction of time with 50% then the reduction goes down.....
- To develop good normative understanding – approx. 8 weeks
- Students patterns can continue Transfer



In-depth learning and progression

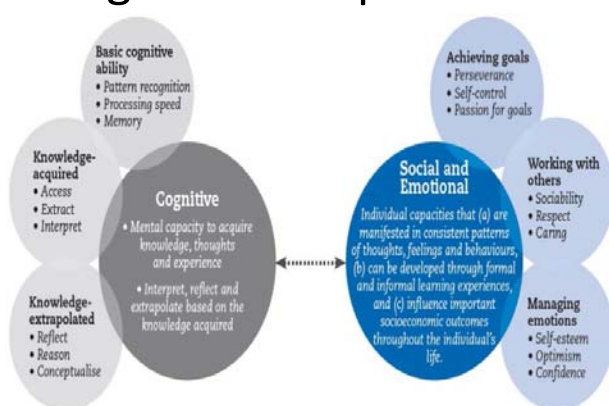
- Robust and flexible understanding
- Transfer to new situations and settings
- Understanding of relationship between concepts and how to use them
- Reflections over the learning processes and outcomes
- Development over time – learning trajectories



In-depth learning and progression

- In-depth learning
 - Cognitive dimension
 - Self-regulation
 - Dialogues – advanced talk
 - Validation of arguments in different knowledge domains
 - Generic and domain specific competences

Framework for social, emotional and cognitive competences (source, OECD 2015)





A broad concept of competence

- Involves solving problems and dealing with challenges in different context, including cognitive, practical, social and emotional aspects of pupils's learning



Subject renewal

- Four areas of competences
- In-depth learning and learning progression
- Building blocks in the subjects
- Cross curriculum themes:
 - Multicultural society, sustainable development and health and well-being



How to create change?

- Implementation strategy – “all” institutions and actors engaged and involved
- Increased focus on curriculum development and developmental work for municipalities and schools
- Development of competences and capacity building
- Research-based knowledge as foundation for further development

Four areas of competences

Competences in the subjects/knowledge domains

- Mathematics, science and technology
- Languages
- Social science and ethics
- Art, design, craft, music, physical education, health and nutrition

Competences to learn – generic and domain specific

- metacognition and self regulation

To communicate, collaborate and participate – generic and domain specific

- Competences in reading, writing and oral communication
- Collaboration, participation and democratic competence
- Digital competences

To explore, inquire, create –generic and domain specific

- Creativity and innovation
- Critical thinking and problem solving





The Committee

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