Refs from talk:

<http://pasisahlberg.com/finnish-lessons/about-finnish-lessons/>

http://www.youtube.com/watch?v=2kK6u7AsJF8

Next Generation Science Standards (NGSS)

talk for NYSS-AAPT (Dan’s ravings)

nextgenscience.org

Dan MacIsaac, Associate Professor of Physics,   
SUNY Buffalo State College <macisadl@buffalostate.edu>

My background:

- past Canadian HS science teacher

- Prepared 200+ Masters physics / physical science teachers since 1996

- I run MSEd (Physics) programs – about 100 graduates in 10years;

- >300 NY Physics teachers have taken coursework from Buffalo State Summer Physics Teachers’ Academy;

- $10 MSP for Buffalo Public Schools with UB and many others;

- 100 columns in The Physics Teacher since 2002

- 3mo Sabbatical at U Helsinki Finland in Fall 2010; 3mo traveling US physics teacher cert programs in Spr 2011

Why change? Dan’s Rationale for NGSS

The US problem:

Teachers not trusted, public schools under political attack   
(NY much better off than most US states). You get what you pay for and some places pay little to nothing (AZ teacher salary ~20k in 2002). Huge pool of “qualified’ but under-motivated unemployed K-9 teachers depresses wages.

Instructional quality in STEM is low -- elementary STEM taught by very altruistic, hard working, underprepared, well-intentioned amateurs (contrast to Finland, other leading countries)

Standardized testing has driven out subjects not tested K-9 (eg science), resulting in race to the bottom for science (NYSED teacher hires Gr 3/ 8 / HS)

Local control is NOT an internationally accepted model – low or distorted expectations (think KS, TN, AZ, MS). We do not overview surgical procedures or engineering accreditation by local elected laypersons. NY and Regents are way ahead historically (see also CT, MA) but it’s grim out there.

Internationally many US schools are being buried. Eg. Finland has Calc in HS, physics in Gr7, same teachers K-6 in Periskoulu, HS Entrepreneurship requirements. High expectations and accountability w/o testing.

Happy to say more about / defend position on any of this.

Next Generation Science Standards (NGSS)

NGSS approach.

- Set a list of PERFORMANCE STANDARDS, don’t involve Federal Govt (political kiss of death),

- provide insightful re-interpretation or mappings of STEM teaching.

- Part of an overall movement called Common Core Curriculum.

DIMENSIONS:

1. Science and Engineering Practices (SEP);

2. Crosscutting Concepts (CC) and

3. Disciplinary Core Ideas (DCI)

Science and Engineering Practices (SEP)

1. Asking Questions (Science) and Defining Problems (Engineering)
2. Developing & Using Models
3. Planning and carrying out investigations
4. Analyzing and Interpreting Data
5. Using Mathematics and Computational Thinking
6. Constructing Explanations (Science) and Designing Solutions (Engineering)
7. Engaging in Argument from Evidence
8. Obtaining, Evaluating and Communicating Information

BIG TAKEAWAY: Engineering Design / Problems and Solutions

Crosscutting Concepts (7)

1. Patterns
2. Cause & Effect
3. Scale, Proportion and Quantity
4. Systems
5. Energy & Matter
6. Structure and Function
7. Stability & Change

BIG TAKEAWAY: Bigger picture than traditional linear canon (think factoids vs grand unifying themes)

DCIs for HS Physical Science

1. Matter and Its Interactions (Chemistry, physical chemistry, Atomic structure, radioactivity
2. Motion and Stability: Forces and Interactions (Forces, interactions, N1-3, gravitation, Coulomb’s Law, Magnetic Fields , EMI, materials and atomic/molecular models)
3. Energy (components, conservation, systems, thermodynamics, )
4. Waves & applications for Technologies for Information Transfer (anatomy of wave, digital transmission and storage of info, EM Radiation hazards, tech devices and wave behaviour)

BIG TAKEAWAY: MUCH EXPANSION TO WAVES AND INFO TECH

FINAL: AAPT supports, but energy language was quite controversial “forms of energy” etc

Final comments:

- Just a list of performance expectations.

- For most of US more rigorous than ever (not for NY, CT, MA).

Implementation is another issue. Much demand for change at K-9 levels, and those teachers are at breaking point already.

I welcome your comments either live or at [macisadl@buffalostate.edu](mailto:macisadl@buffalostate.edu)

Dan MacIsaac