**Science Leadership Network - Meeting Notes** 1/8/16

NYS changes bastardized [focus] and [coherence] of NGSS

* In general:

Additions are less damning than re-shuffling

**Messaging the framework**

***Changes the method by which students learn***

- Substantiated from research

- More like how scientists work

- Move more toward practice than content

***Children are born investigators***

- Try to manipulate their environment

- Will work at trying to solve problems collaboratively

- Like to question and investigate

***Science is for all students***

- As adults they will have to vote in an informed manner

- As adults they will have to make scientific choices about their health

- As adults they will have to make decisions in their home, work, etc.

***Big concepts***

- Fewer big ideas

- Crosscutting across disciplines

- Core ideas

***K-12 Coherence – crosscutting –***

- Developmental progression / learning progression

- Build on and revise towards coherence/accuracy

- Less broad, more deep

***Practices***

- Application – DO science, inquiry integrate knowledge and practices “scien. Inquiry and engineering design”

- Engineering, problem solving

- Real human problems

***The Framework was designed with learning progressions***

- Children from all backgrounds are natural born investigators

- The Framework is developmentally appropriate

- It builds layers of understanding over time

***The new framework is based on integrating the three dimensions of science and engineering practices, disciplinary core ideas and crosscutting concepts.***

- The framework pushes teachers to use models and hands-on experiences to develop science concepts

- Crosscutting concepts help teachers to discover links between science concepts

- DCI allow students to develop their thinking over time

***The framework was created to develop critical thinkers who can engage in discussions about science related issues in our lives.***

- It’s been 15+ years since the last science curriculum initiative

- Interweaving with common core math and ELA

- In today’s society it’s essential that all citizens have an understanding of science and technology

***Framework provides a greater focus on communication***

-p62 … data must be represented in a form that can reveal … to others

-p55 Students at any grade level should be able to ask questions…

-p73 Recognize major features of scientific arguments

-p77 … students likewise need opportunities to communicate ideas…

***Increased emphasis on the process of science as opposed to specific content details.***

-p48 quote

A focus on practices avoids mistaken impression that there is one distinctive approach…

***Science for all students in order to produce informed citizens in the area of science.***

-p12 quote

The committee’s vision … educating all students in science…

***Shift practices w/in the classroom***

- Problem solving, inquiry and questioning

- Collaboration; critical thinking, and sharing findings

- Planning, implementing, creating, adjusting, using evidence, and persevering through the problem

***Clarity of learning targets***

(p11) – What students are to learn

- What grade level

- To what depth

***3 Major Dimensions***

- Scientific and engineering practices

- Crosscutting concepts (unifying sci + engin.)

- Core ideas in 4 areas: phys. sci; life sci; earth/space; engineering, technology, applications

***Place more investment into the practice than the endpoint.*** Pg 45

- Increase dialogue during activity among students

Figure 3-1

Practice #7 – “engaging in argument”

Teachers: sharing ideas among peers

***“Students cannot comprehend scientific practices, not fully appreciate the nature of scientific knowledge itself, without directly experiencing those practices for themselves.”*** Pg 30

- Refer to: “8 Practices” from p49

***Establishing a framework for the progression of concepts and practices.***

- K-12 topics coordinated state-wide

***The framework consists of 3 dimensions.***

1-Describes scientific and engineering practices

2-Describes crosscutting concepts – that is, those having applicability across science disciplines

3-Describes core ideas in the science disciplines and of the relationships among science engineering, and technology

However, in order to facilitate student learning, the dimensions must be woven together in standards curricula, instruction, and assessments.

Facts Builds on 2 prior works

1-Benchmarks for Science Literacy – published by the American Association for the Advancement of Science

2-NRC’s National Science Education Standards – NSES

***The framework promotes students to engage as scientists and engineers by getting hands-on through the 8 practices.***

-Evidence “As children try to understand and influence the world around them, they develop ideas about the world around them and how it works. In fact the capacity young children from all backgrounds and socioeconomic levels to reason in sophisticated ways is much greater than has long been assumed.”

***Understanding develops over time.***

-“If mastery of a core idea in a science discipline is the ultimate educational destination, then well-designed learning progressions provide a map of the routes that can be taken to reach that destination.” Pg 26

***There is a lot more “true science” in the NGSS.***

- Students are asked to investigate and tap into their natural curiosities.

- Sec Box 3-1 on pg 42

***Engineering and how it ties in w/ science***.

- Science is why, engineering is what can be done to address a human need or want. Pg 54

***These new standards push us towards a better balance of “doing so you can know” and “knowing so you can do.”***

- “Scientific and engineering practices” and “crosscutting concepts”

- “Framework is designed to help realize a vision for education in the sciences and engineering in which students, over multiple years of school, actively engage in scientific and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields.”

- These standards “takes into account two major goals for K-12 science education: (1) educating all students in science and engineering and (2) providing the foundational knowledge for those who will become the scientists, engineers, technologists, and technicians of the future.”

***Increase interest in STWM fields and improve science literacy in all citizens.***

- K toward science and engineering (application).

- Engage in scientific investigations and arguments to achieve depth of understanding of ideas.

- Integration of science knowledge and practices to engage in science inquiry.

***Chapter 2*** outlines the guiding assumptions and organization of the framework. These principles are a child’s capacity to learn science, core ideas, developed understanding over time, knowledge and practice, student experiences, equity, and the investigative nature of kids.

Core ideas are limited to allow depth.

The general structure of the framework is: sci/eng practices, crosscutting concepts and core ideas.

***Scientific and engineering practices***

- Children should be involved in the practice of science and engineering.

- The chapter differentiates science and engineering practices.

***Chapter 1 – New Framework***

Message: The overlying framework (S&E, CC & DCI) is used to construct every performance expectation and learning outcome in the standards

- Every PS, LS & ESS has all three framework pieces embedded.

- Framework is general and then outcomes are more specific from that.

***Chapter 2 – Organization***

Message: The framework is organized into 3 main sections and each section is applied to construct the learning outcomes.

- Science and engineering practices involve design, investigation, analysis, construction, etc.

- CC involve patterns, cause and effect, etc.

- DCI involve the core science knowledge necessary.

***Chapter 3 – Scientific and Engineering Practices***

Message: Students should be able to learn science by doing science (modeling, investigation, data gathering) and apply what they’ve learned.

- Standards include S & E practices embedded in each performance expectation

- Standard heavy on verbs like model, design, construct

***Chapter 2 – Children are born investigators***

- 7 year olds determining effect of surface texture or distance (of a car) traveled.

- Infant child playing peek-a-boo with blanket and inanimate object (cause-effect, object permanence)

- “The capacity of young children – from all backgrounds and SE levels – to reason in sophisticated ways is much greater than has long been assumed.” p24

***Science must be done (hands on) by students.***

- “…engaging scientific inquiry requires coordination of skill and knowledge simultaneously.” P41

\*“Tell me and I forget, teach me and I remember and involve me and I learn.”

Learning Pyramid

Avg student retention rates

Lecture

10% Reading

20% Audiovisual

30% Demonstration

50% Discussion

75% Practice Doing

90%

Source: National Training Laboratories; Bethel, Maine

***Chapter 1 – Science standards should be accessible for all.***

- “… educating all students in science and engineering …” p10

- “… course options, like AP or honors courses, should be provided that allow for greater breadth or depth in the science topics that students pursue …” p10

- “… requires that all students are provided with equitable opportunities to learn science and become engaged in science and engineering practices; access to quality space, equipment and teachers to support/motivate learning…” p28

***“The framework and standards that resulted from it will not improve science education unless other components – curriculum, p.d., instruction, assessment – change so there is alignment.”***

- Elementary teachers, who are typically not science majors, are going to feel uncomfortable without direction.

- Engineering vs. scientific method

True Science – The standards reflect the true process of science and not a system of beliefs …

- Climate 48% of Americans (Faux News)

- 27% scientific literacy

- We use models and defend opinion with real data and experiment “Nullius in verba”

- Founding fathers – Deists

- age of reason

- age of enlightenment

- no miracles

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| **Happy About?**   * Mainly NGSS * Interweaving (sep, dci, cc) * Support of this group * New standards * Didn’t stray far from NGSS * Consistency at grade level * Standards phrased as demonstrations of learning * Connections to other learning standards * Articulation across grade levels * Critical/process skills are embedded into the performance expectations * Standards are the processes to get to the content * Science is a quest for knowledge/understanding (not just facts) * Consistent format within document * Earth Science – “Big Ideas” are well represented at MS/HS * Paring down of # of facts to be learned (more in-depth learning) * Assessment boundaries * Lit. standards * Layout CI / crosscutting / practices * Specific standards for individual elem. Grades * Acids and bases * Less content – more “big ideas” * Less memorization * More creative * Reading, writing and math CCSS incorporated * Focuses on process deeper understanding at younger ages * K-5 specificity * More interesting DCIs * Inquiry focus * Performance indicators that drive labs/projects * Specifics for PK-6 * Connections to C.C. * Color coding * Global climate change * More thoughtful rollout * Prescribed PK-5 Good! * Integration of reading/practice/math/commun./engineering… * Much better nat’l std. alignment * Progression easy to see * Transfer b/w schools easier | **Wondering About?**   * Assessments? * Timeframe * Will this follow the path of common core? * How vocabulary heavy will it be? * Will there be direction about suggestions for 6,7,8th grade specific standards? * Will ELA and Math CCLS align appropriately across grade levels? * How to organize MS content * #ing in HS standards systematic? * What process needs to occur in order to write curriculum at the school level?! * How do we prevent/help teachers not get overwhelmed?! * Assessment * Curriculum alignment in CNY region * How deeply to instruct in DCI. * Middle School/High School:   + Are school districts left on their own to decide when and where each performance expectation goes?   + Will we, as a REGION make collaborative decisions?   + Assessments   + Roll out   + Pro. Dev.   + Is Pre-K mandatory?   + Assessments?   + Chemistry and physics for all?   + General high school science?   + What inquiries will we have to develop and how many PE’s/inquiry?   + Why was wording changed from NGSS?   + Will MS have to be departmentalized?   + Schedules and 40 min. time frame – how do we get deep into inquiries with time constraints?   + Certification/HS courses organization – Topical arrangement??   + Assessment   + Acceleration options   + Will state assessments reflect content, grade level or both?   + Assessments (frequency, format…)   + Prescribed 6-8?   + Rollout (1 yr, 2 yr, 3 yr?)   + Support for teachers teaching new content   + Districts w/o PK? – “Are kids behind” @ kindergarten? |
| **Concerns?**   * Additions to NGSS keeping in mind science for all * Mile wide? * Alignment with assessments * Banding is only grade specific K-5 * Asked to change instruction without knowing how the standards will be assessed * Managing the paradigm shift * Professional D (especially E.S) * Creation of PK standards * Jumping the gun with writing science curriculum * MS Standards are not grade level specific * Pre-K standards being carried out in non-district Pre-K programs * If Pre-K is not mandatory, students will start behind their peers * Middle school standards are not by individual grade * No human impact? * Assessments * Assessment * Transition to collegiate level science * Time transition students * 6th grade * Teacher certification * 6-8 not grade-level specific * 6th grade PD * K-12 PD * Crowded curriculum 6-12 * Science for all? * Lack of “grade banding” after grade 5 * Finding time as a district to collaborate * Collaboration b/w districts * No district curriculum coordinator! * District $ for resources (books, materials…) ⮱will budgets be approved | **Concerns/Wonder (combined)**   * How will 6-12 be organized and will it be consistent across region/state? * What if C.C. changes? * Elem. Teachers training on new standards |

**Feedback for State**

* Stop Adding … Less is More
* Provide examples of proficient student work (less is more – stop adding)
  + Performance expectations invite wide-ranging interpretations
  + Clarify end-of-course expectations
  + Assessment boundaries are road
* It’s Time … (to update practice and standards)
  + It’s been 20 years since revising science standards (+ tech)
  + Science and science education has changed in that time
* Less is More …
  + Inquiry and spiraling concepts 🡪 depth of understanding
  + Limited # of core ideas
  + Developmental progression
  + Integration between content knowledge and practice
* Science for All
  1. Science literate citizenry so can make informed decisions
  2. Growth mindset
* Make sure the progression of standards is logical and developmentally appropriate
* Examples of proficient work for each standard
* We would like to see examples of student work for specific standards. This will clarify the level of intensity the standard needs to be taught.
* The standards provide a vision but until we know the end product (assessment) it is difficult to know the full interpretation of the spiraled content.
* Provide examples of proficient work.
* Make middle school individual grades with specific performance expectations.
* Encourage a regional approach to writing curriculum.
* We like how the critical thinking/process skills are imbedded within the framework.
* Add “with prompting and support” to each PreK and K performance expectation. “with guidance and support”
* Give more direction at grades 6-8
* Need more concrete layout for implementation
* Specifics at MS level – not banding
* Pulling PE’s from other grade levels to PreK and the effect on coherence
* Examples: How do we work the dissect subject model in 9-12 to morph into cross-cutting/engineering NGSS and how will the state assess this?
* I am concerned about the rearrangement of chemistry and physics. Align the curricula is good but how do we consistently teach physical science if they are not designated into courses – Do we need a new general PS course?
* How will this translate to assessment and graduation requirements?
* The expectations of PreK are random and not correlated to development and/or topics.
* Instructional \_\_\_\_ and reaction in middle and high is unclear and may be overlooked if not identified in one course or another.
* What drove the re-addition of the NYS specific performance indicators?
  1. Survey responses
  2. Thoughts of being ahead of other states
  3. Necessity for coherence, progression of curricula
  4. Importance for science literate citizenship
  5. All of the above
  6. None of the above
* Clarity & Specificity: PreK should be pre-teaching K standards since it’s not a mandatory program. Pulling these topics impacts progressions in future grade levels.
* Band science standards K-8
* Assessment
* The NYSSLS appear to take an important step in integrating process and interrelationships into our instruction.
* There needs to be a very thoughtful approach to implementation. (Steps, professional development)
* Take the time to develop organization for grades 6-12 with progression through courses. Change the way we assess the “practice” appropriately after giving examples of what that will actually look like.
* What does the end product look like?
* What grades will be assessed? And on what content area(s)?
* How will this be implemented – all at once, elementary first, specific grades?
* Stick to NGSS!!
* We appreciate K-5 bands.
* Prescribe 6-8 GL bands to avoid student gaps/overlap
* Prepare teachers (cert./training) now
* Provide districts with resources (gas lines, etc.)