WASHINGTON SCIENCE ADVISORY PANEL
December 18, 2007 Meeting Notes

The Washington Science Advisory Panel provides input into the review process and the development of recommendations. The first panel meeting was held at the Puget Sound ESD, in Renton, on December 18th from 10:00AM to 4:00PM. The meeting was intended to provide a forum for introductions, to orient panel members to the review process and the standards movement, to facilitate a discussion of the strengths and weaknesses of the current science standards, to obtain panel input on key considerations of Washington's science standards, and to present the benchmark state/nations and 9 review criteria that will be used in the upcoming Expert Panel Review of the Standards. This document summarizes notes from the meeting for each of the following agenda items:

- **Welcome & Introductions**
  Jeff Vincent, Washington Science Advisory Panel Chair
  Introductions by all attendees
- **Overview of the review process and the Panel's role**
  Presentation by David Heil, Co-Director
- **Highlights from the standards movement**
  Presentation by Rodger Bybee, Co-Director
- **Assessment of the strengths and weaknesses of the current Washington State Science Standards**
  Panel discussion facilitated by David Heil
- **Panel input on key considerations for Washington's Science Standards**
  Panel discussion facilitated by David Heil
- **Presentation of the selected comparison states/nations**
  Presentation by Rodger Bybee, Co-Director
- **Overview of 9 review criteria and a discussion of what these mean relative to Washington's Science Standards**
  Presentation by Harrold Pratt, Co-Director
- **Close of Meeting**
  Jeff Vincent, Washington Science Advisory Panel Chair

Washington Science Advisory Panel Members in Attendance:

Panel Chair: Jeff Vincent, SBE Board Member

- Len Adams
- Jeffrey Bierman
- Georgia Boatman
- Theresa Britschgi
- Chris Carlson
- Grant Fjermedal
- Jen Fox
- Mario Godoy-Gonzalez
- Judy Kjellman
- Sheldon Levias
- Michael McCaw
- Brian MacNevin
- Judy Morrison
- George (Pinky) Nelson
- Kimberly Olson
- Steve Olson
- Ethan Smith
- Barbara Taylor
- Kristen White

DHA Project Team Members in Attendance:

- David Heil, Co-Director
- Rodger Bybee, Co-Director
- Harold Pratt, Co-Director
- Kasey McCracken, Project Manager
- Lauren Seyda, Project Assistant

SBE Staff in Attendance:

- Kathe Taylor, Policy Director

Observers:

- Mary McClellan, OSPI Staff
- Wayne Gilman, OSPI Staff

Welcome & Introductions
Jeff Vincent, Washington Science Advisory Panel Chair

Jeff Vincent provided a welcome to the meeting, emphasizing the importance of the work that the panel is to embark on. He stressed the need to prepare students to work in a new economy in which skills in production and biotechnology are valued, and he emphasized the need to provide leadership to give science an important role in education so that the there is plan to help youth live and work in the 21st century. During this discussion he pointed out that:

- Math is currently the focus of educational reform efforts, but science assessment will be required in 2013.
- Only 35% of students passed the WASL in 10th grade.

Vincent said that the review is intended to ensure that the K-10 standards are appropriate and aligned with assessment tests, and that the review process is intended to provide comments for revisions to the OSPI. He urged the panel to set aside preconceived notions and come to the table with an open mind. He suggested that the challenge that the panel faces is in having a clarity of purpose, knowing what to get done, and being clear, quick, and efficient in the review process while focusing on students. He concluded by reminding panelists that “The nation is watching. We’re using other states as examples, but they’re watching us for better improvements.”

Introductions by all attendees

Jeff Vincent – President, local company. SBE board member for 2 years. This is a very important issue for kids. The next 20 years are critical for kids and the nation.

Kathe Taylor – SBE staff member. It is important to understand newspaper/breakthroughs.

Len Adams – Tacoma, Pierce County Health Department employee. I hope to learn more about SBE and help science exposure for kids. This impacts voting on issues like transportation and technology.

Sheldon Levias – Graduate student at UW in the Learning Sciences Program and former science teacher. Helping kids in everyday lives connect to science is important.

Barbara Taylor - 21 yrs classroom experience. Taught home/family life education. We must help students understand the cost of fuel prices and concepts of bio-fuels, agriculture.

Georgia Boatman – Elementary school teacher. Interested in Science. Science teaches kids to think. It provides opportunity at all levels.

Judy Morrison – WSU Tri-cities. Biology/Chemistry Teacher and Teacher trainer. It is important for kids to understand the natural world.

Steve Olson – Chemistry/Math Teacher. Kids need to consider Science as a career and be able to compete against foreign students.

Kristin White – Vancouver, Washington. Elementary school teacher for 10 yrs, and now a middle school teacher. I work with Excel students and want to make sure they're represented.

Mario Godoy-Gonzales – From Chile. Visiting teacher but hired to teach language, history, science, and math in 2 languages. I like to help ESL kids who are afraid to take science. Exposure is important.

Jeffrey Dean Bierman – 12 years as Physics Teacher at Gonzaga. I want to get the standards right.

Theresa Britschgi - Director at Bioquest. Science education is important when thinking about eliminating things like global infectious diseases. We need more solutions, not problems.

Kim Olson – Instructional Facilitator, Tacoma. Trainer. I want to align the curriculum to standards.

Grant Fjermedal – Reporter for Seattle Times/ Associated Press, with children in the public school system. Also a science teacher volunteer. Authored a book on monoclonal antibodies.

Chris Carlson – On faculty at Fred Hutchison ofr epidemiology. Was a member of the math SBE panel. It is important to synchronize math and science.

Judith Kjelman – 40th year as a Biology Teacher at Yakima Valley Community College. collaborative learning. Was a member of the Science College Readiness team.

Brian MacNevin – 8th grade Science Teacher in Shuksan.

George Carlson "Pinky" – WWU. Worked on Project 2061 in Washington DC. Standards are important tools for teachers. Science is important to children.

Michael McCaw – Currently a glass artist. I would like to see science curricula integrated into lives of students, given relevance with applications.

Jen Fox – Seattle Public Schools. I use the standards as a familiar start with teachers. It is hard to make sense of the standards. We must bridge the gap between standards and teaching.

Ethan Smith - Science Teacher, Tahoma School District and Instructional Technology Coach.

Overview of the review process and the Panel's role
Presentation by David Heil, Co-Director
Note. PowerPoint slides are attached.

David Heil provided an overview of the review process and the panel's role in the process. He introduced the legislature that called for the review of the science standards. Heil then walked the group through a seven-month timeline for the project.

Highlights from this presentation include:
- The Washington Science Advisory panel will be involved throughout the review process so that panelists may provide their insights to inform the process.
- OSPI is tasked with re-writing the standards based on the recommendations from the review process.
- After OSPI revises the science standards the Washington Science Advisory panel will meet a final time to determine if the recommendations were implemented as intended.

Highlights from the standards movement
Presentation by Rodger Bybee, Co-Director
Note. PowerPoint slides are attached.

Rodger Bybee presented highlights from the standards movement. He provided a timeline outlining the publication dates for landmark documents related to the movement, discussed the power of state standards for science education, and concluded with a discussion of important pitfalls and precautions when developing and implementing science standards.

Highlights from this presentation include:

- The new guidelines for NAEP 2009 are an important and comprehensive document, bringing the benchmarks and standards together.
- Standards can change fundamental components of the educational system, centering on teachers and teaching curriculum, materials, and assessment.
- Standards should facilitate coherence from standards to instructional materials to assessments across the board. These are not separate pieces. It is important to be attentive to educational coherence, developmentally appropriate standards, and scientifically accurate standards.
- As a nation, the approach has been to allow the question of how the standards should be implemented to be answered locally.

Comments from Participants:

- One panelist commented that standards are more than content, suggesting that there are few cases where content is completely wrong. Instead, improvement comes from components of the system. It is important to address teaching and development of teachers, assessment, programs, and the education system.
- David Heil suggested that the standards movement provoked an earnest look at the nature/history of science and gave inquiry heightened value.
- The group discussed the differences between content and performance standards. There was agreement that it is important to know which type of standards the state of Washington wants. Harold Pratt pointed out the that there is sometimes an assumption that standards can do everything, saying that it is a myth to believe that standards can be written to provide instruction and solve all problems.

Assessment of the strengths and weaknesses of the current Washington State Science Standards
Panel discussion facilitated by David Heil

David Heil facilitated a discussion exploring the strengths and weaknesses of the current WA science standards as they are documented in the K-10 Grade Level Expectations (2005) publication. After brainstorming the strengths of the standards the panel members independently ranked the top ten most significant strengths of the standards. This process was repeated for the list of weaknesses.

Hand-count as to panel member's familiarity with the Washington science standards document:

- All have read document.
- About 95% have worked directly with the document.

List of Strengths with Overall Rank Shown in Parentheses

(1) Recognizes "all students."

(2) Initiated more in-depth look at curriculum and teaching.

(3) Helps users to understand science learning progression over time.

(4) Relative "mass" of EALR number 1 versus EALR numbers 2 and 3 is appropriate.

(4) K-10 focus results in science actually being taught in lower grades.

(4) Initiated cross-grade level discussions about science.

(5) There are only 3 EALRs and 42 GLEs (limited number is appropriate).

(6) Standards act as a catalyst for district-wide professional development and curriculum development.

(7) EALR #2 (process of science) is included and given importance.

(8) Standards have given rise to clarity on core science concepts.

(8) Lack of curricula/instructional specification is good.

(9) There is an even distribution of physical, earth, and life sciences in EALR #1.

(10) The level of content and grade-level distribution is based on NSES/research.

(10) Document provides examples for practitioners.

(11) Document is ambitious.

(11) Approach enables teachers to focus on their curricular/instructional decisions.

(12) Chose appropriate focus - looking at content from two different angles.

(13) Document is broadly distributed in the field.

(14) EALR #3 is also important, good to have it included.

(15) Evidence of student learning are grade-level targeted.

(16) Gives form to the "informal" sector.

(16) Used Blooms Taxonomy to outline lower levels in lower grades and higher levels in upper grades.

(17) Appendices are valuable (e.g. the glossary).

(18) Document is stronger for curriculum guidance.

(18) Document is stronger as test specification document

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List of Weaknesses with Overall Rank Shown in Parentheses

(1) Lack of strong connection between standards and assessment.

(1) There is an implication that all content is covered in each grade.

(2) Grades 9-10 are extra challenging with too much too cover.

(3) Document lacks clarity on what component is the actual standard.

(3) Document suffers from being just a "book of lists," lacking narrative explanations.

(4) Not very usable document for teachers.

(5) Use of Bloom's Taxonomy - the verbs used are at the lower level of the taxonomy.

(5) GLEs don't describe detail necessary for implementation (curricula, instruction).

(6) Forces "too much" to be covered and not enough time to do it all.

(7) Vocabulary is not consistent with common practice in field.

(8) GLEs don't reflect personal student attributes, as referenced in the Preliminary Science College Readiness Definitions.

(9) No clear aim is stated in the document.

(9) Details are often misinterpreted when implemented.

(10) Document says it will be the basis for WASL but doesn't hold true.

(11) Volume forces teachers to let go of later EALRs.

(11) Confusing presentation.

(12) Lack of "topography" to know crucial vs. supporting elements.

(13) Standards can feel intimidating and over encumbered, not enabling.

(13) Lack of support for the "big picture" view by teachers.

(14) There is a sense that there must be a "hidden curriculum" to bridge from standards to assessment.

(15) Falls short on math/analytical linkages.

(16) Use of systems term is confusing.

(16) Requires user to "look elsewhere" but doesn't provide resources.

(17) Similar concepts in math and science standards are described differently.

(18) Appears to be a "cell-filling" exercise (detailing expectations for every grade level).

(18) Content emphasis varies greatly.

(18) Emphasizes more technical aspects of science (facts, mechanical processes, etc).

(19) Main concepts "fall apart" when spread across grade spans.

(19) Document lists vocabulary but offers no definitions.

(20) Lots of physical science less on living systems.

(20) Sometimes "set up" students to not do well on assessment (discouraging).

Panel input on key considerations for Washington's Science Standards
Panel discussion facilitated by David Heil (DH)

DH – Are the standards used more for curriculum guidance or performance, currently?
Curriculum guiding: 3 hands
Performance inventory: about 85% of panel

- The original document was just EALRS. The GLE's go further.

DH – What is the guiding purpose of the standards?
Are the standards used to guide curriculum? About 10 hands.
Used to guide assessment? About 12 hands.

Rodger Bybee: EALRs should be used for curriculum development but as soon as you use/account for the evidence of learning bullets, that's the assessment. If you are writing the test that's where you go for the content.

Panel Comments:
- Performance is how you measure skill. But they look and seem similar.
- How do you measure "investigate"-type verbs?
- In the document, the gray W's are possible things on the WASL.
- The W's can be used to guide instruction. Teachers look for things what could be on the test.

DH – When someone gets the document how do the use it?

- It's important to make a choice and stick with it, to be consistent. As a group, is it important to emphasize curriculum or performance?

Harold Pratt: Some states try to merge the two. Some make the same document do both. Any state needs both elements. The questions is where do they reside?

- Assessment will be developed but how explicit should it be? For teachers, more explicit is better than less. I don't think "performance" can be avoided at all.
- How can it be best used? We need a document with this robustness.
- When planning my instruction, I don't want to look for assessment. I want to look for topic and depth of knowledge and how to bring that out, specifically for this grade level.
- I want to find out what major ideas are kids going to learn and remember forever. I want to help frame what big ideas I can use to teach my kids.
- I'm worried about state mandated curricula that are the "same." They should be diverse and recognize diverse areas, demographics, interests of students.
- I want specifics. I don't want to be told how to teach but I want the big picture.
- Knowing what needs to be taught not how it should be taught is important.
- Teachers plan backwards using the WASL as a guideline.
- If you put curriculum standards separately, then the performance standards will be used.

- It's a priority to create curriculum standards that bring excitement to kids.
- Test specifications are what you're describing; types of preparation; things kids can do.

DH – In the current form, standards are being used different ways. Are they stronger in performance over curriculum planning?

- It's more humanistic to create a document about what to learn than what to test for.

DH -- Does the document currently have that flavor?

- Yes, in skeletal fashion. You want to learn this and that and want to add more without getting too specific. But it shouldn't be how to instruct. It's a fine line. If anything, I would like to add more but I don't want to tell teachers what to do. I would push more towards curriculum rather than more narrowly.

Rodger Bybee – Keep in mind that the standards document is a policy document for the state. The policies are intended to direct and guide. They must be interpreted for different types of programs and instructional materials. For example, lines of curriculum, professional development, the test (WASL) etc. – It may be possible to address these different dimensions but it cannot do everything in one document. Otherwise it becomes something that is interpreted differently given different perspectives. How you sort that out is very important.

DH – [We need] clarity on what's there and how it's used. Roger suggests that how they're separated is important.

- Regardless of the direction, I would like to advocate that the curricular area needs to be considered. The document doesn't provide enough direction to teachers because… reading a GLE a teacher could teach something at the high school level to Kindergarteners (if you remove the [evidence of learning] bullets).
- I'm bothered by the 3 rocks example. "Distinguish between sedimentary, igneous, etc." Just having rules on how to instruct is not adequate.

DH – Let's jump to the 3rd key consideration. Grain size. Changes to how the standards are framed and formatted. Depth of information. Are the standards an inch deep and a mile wide? Or are a few covered but deeply.

- It's ironic because in math… it's an inch deep mile wide and then spiral… At the Leadership Assistance Science Education Reform (LASER) initiative they said our standards for science are written an inch deep and a mile wide. My preference is to go deeper – look at the GLE. At our school we are in curriculum adoption… We had grade 1 through 12 teachers and everybody indicated what they were teaching throughout the year and we looked at how we were lining up with the GLEs. No teacher was covering every green box. We were more into going deep.
- Another example of curriculum versus performance standards. By 10th grade you should know photosynthesis, etc. But what is the threshold. How deep or detailed?
- Back to the Harvard example: there ought to be certain things that 5th graders ought to know. We need more guidance than just "living things."
- Remember that this applies to all students (and all teachers) what should all students know even those not going to college? They should be able to read a newspaper for example.
- The WASL is the high standards test. I need a "shopping list." I want my students to be successful on the WASL.

- I agree to want a "shopping list" but I want the list to be short. That suggests depth. I don't feel guilty wanting my students to do well on the WASL. It's all about depth. Research shows it is the only thing that is effective.
- Clarifying what deep means: biology (for example) is so broad. Topics and subtopics. In high school we teach more than the standards. I worry that depth means more facts. I want deeper understanding of the process and interactions. Not just memorizing. I'm cautious to tell teachers more depth.
- I think you need both. Some inch deep mile wide to convey how much there is to learn. The only way to know about process though is if you dive deep. It doesn't matter what it is as long as you go deep. The world is an onion, with different layers.
- In 8th grade, there is a push towards depth. That is a big conceptual leap that the amount of mass doesn't change. 9th grade textbooks are too specific and there is too big of jump between grade level textbooks. Teachers need to pay attention and have assistance.
- The question is grade span vs. grade level: 9th and 10th grades are muddled because they end early and cram in too much.
- From a kid's perspective: what if a kid moves. There is a problem of double or lack of coverage.
- Kids will cumulatively cover all but maybe with different topics (plants, animals, earth systems, etc).
- Kids have situations where they skip topics or components of process in the curriculum. Grade-span standards give more flexibility. But could they could create a gap.
- I've seen gaps in different classrooms at the same school.
- Disadvantaged children find it hard to find the resources to catch up.
- The challenge is if there's too much to cover in a given amount of time.

DH – What can standards do for you to reach your goals?

- Depth is important. Kids need a deep foundation knowledge but sometimes there are check offs and dates. In reality, teachers are held very accountable to the list.
- Not all highly qualified teachers need a list.
- If you look at books and teaching science to schools, younger kids are very capable of high levels of learning. If we restrict depth at lower grades because of the topic, some kids can achieve higher than we're observing. We are limiting some kids.
- This is the floor, but you can go past it. We can push kids higher but this is minimum standard.

[Several disagrees]

- Thinking about how questions are phrased is important. For example, for kindergarteners you will paraphrase while the higher grades will go deeper.
- At lower levels kids may paraphrase less because they are immersed in the subject.
- There is a question of evaluation versus whether they should know and should open eyes to things (global warming).
- For the low functioning kid… The kid can't write, but through drawing and explanation, can he/she can demonstrate understanding. It won't help with WASL score but shows performance.

DH – Remember learning and the learning process. This is the reason we do this work. We are gaining a deep understanding of not only what the brain can do but more how it's done. Brains are very capable.

- If you don't know what you're looking for can't find it (for example by Googling).

- Do we want a minimal understanding of lots of things or deep understanding of 3 things?

DH – But what three is the question.
- There is not necessarily a limit. We can go past that.

DH – Greater depth is of value. The standards are weighted towards content (EALR 1). Logical and critical thinking is very important in science. Should there be a greater degree of emphasis on critical thinking?
- More, the most important thing to do is teach critical thinking. If it is learned in even one area, it will apply to others.
- But transferring from one area to another is hard.
- We need to create citizens who'll pull away from tv and media.

DH – Is the current level of critical thinking enough?
- There are references on how to set up experiments but not on "bad science", which is seen in politics and the media. Students must be able to take a part and be critical.
- The idea of being critical is buried in the "nature of science" and applications of science.
- I think the emphasis is there but there's too much other content for teachers.
- Students need content and basic knowledge of facts but there is too much attention to facts. How do I avoid fooling myself is the question.

DH – What about the nature of science, history, and the context of science?
- History should be included to give context. There is a misconception now of scientist specialties. They need broad context.
- Middle school science is void of math explanation and analysis.
- You need math for science, so are we discouraging scientists?
- To look objectively, you need math.
- Math is at the high school level, but it's ancillary at elementary level.
- We can teach inquiry and experimental design in a formulaic manner, but critical reasoning is vital to the process. It not just about how to write a 9 step design.

DH – If you use experimental design it can be used across subjects.
- Formatting and numbering in the standards could be used to make this more clear to teachers.
- More critical thinking is needed in grades 8 and 9.
- I think history should go back to history class.
- Scientific development is history in science. All science is history. We are constantly building on ideas in science.
- This idea is already in the document.
- In middle school we talk about scientists and inventions.
- The process of science needs to be emphasized and moved to the front. This becomes a teacher preparation issue. It is harder to teach than facts.
- EALRs are taught in isolation. The first 2 months of school are devoted to inquiry. Then content is taught the rest of the school year. Inquiry and content are separated.
- Teachers should be using EALRs 2 and 3 to teach EALR 1.

DH – So, we need ways to integrate all EALRS?
- If there's a limitation of history, it conveys the idea that science is static.

- Maybe we are getting hung up on the term “history” in terms of educational approach. Theories are not in context. The most valuable ideas get most coverage (historically and currently in news, etc.)
- I don’t have problem with history, but who is going to tell the teacher history, what happens over time, it’s a personal choice of which history to cover. There are many versions. It’s not specified. History is very nebulous.
- It is not necessarily about specific details but when students read/hear history students laugh that it was reality and all they knew at that time. It lets kids think that they can have ideas based on what they know now. Developing theories on observations on things you know.
- We all agree that there’s too much in there. It is important to talk about what to take out.

Presentation of the selected comparison states/nations
Presentation by Rodger Bybee, Co-Director
Note. Powerpoint slides from this presentation are attached.

Rodger Bybee discussed how the comparison states and nations that will be utilized in the review process were selected. He described an approach that utilized data from multiple sources, including the New Economy Index, national reviews of state standards documents, and national and international assessment results. The intention was to look for states that are comparable in terms of size and economy and to identify benchmarks that are informative because they are the top performers in science. The benchmark states and nations that will be used in the review are Massachusetts, California, Colorado, Singapore, and Finland.

Highlights from this presentation include:
- Washington comes out very well on the New Economy Index. – We want to at least maintain that position economically. All of the selected benchmark states are in the top 10 on the New Economy Index.
- The organizations that have conducted national reviews of science standards approach the review with different priorities. Fordham is very conservative, while the American Federation of Teachers is more liberal.
- With regard to the selection of the benchmark nations:
    - Singapore is consistently one of top performing nations. Singapore is a small country, and the ministry of education essentially says this is what we do. They are very interested in inquiry, which leads to product development.
    - Finland does consistently well in science and math. They have a coherent curriculum. They place high value on teacher education. They implement research on how students learn – system wide, at the undergraduate level and in teacher development.
    - TIMMS and PISA approach science assessment differently.
        - TIMMS is curriculum based assessment – It asks: How well do students do based on the curricula we have?

  - PISA doesn't care about curriculum. – It asks: At 15 yrs old if you present students with a scientific issue in some context how well do they do? Can students: 1) identify science in context; 2) explain phenomena scientifically; 3) use that evidence and information, to communicate, to make a decision, and to formulate an argument?; and 4) function in real life situations.
- Within country variation is sometimes greater than between country variation (in terms of performance on science assessments).

Overview of 9 review criteria and a discussion of what these mean relative to Washington's Science Standards
Presentation by Harrold Pratt, Co-Director
Note. Powerpoint slides from this presentation are attached.

Harold Pratt provided an overview of the 9 review criteria and led a discussion of what these criteria mean within the state of Washington. He discussed how the criteria will be used in the review process, and described the manner in which the Expert Panelists will work to agree on definitions so that they are able to rate the Washington document on the criteria. Pratt then reviewed of each of the 9 definitions: Clarity, Rigor, Content, Coherence from grade to grade, Balance, Depth, Specificity, Accessibility, and Measurability. He presented preliminary definitions that are derived from those created by ACHIEVE, an organization that has worked with states to improve their science standards.

Pratt posed the question: Regarding the issue of depth: the question is whether Washington is ready to commit change to a change in approach.

Panel Comment:
- Grades 9,10 rush to cover more than depth.
- I think Grade 4 is over-tested, so science was moved to grade 5.
- Depth – We should ask the teachers whether there are too many topics to cover.
- The struggle right now is to get through it all. I don't even attempt to cover it all. There are way too many.
- Should we scratch out/eliminate topics?
- When you try to take things out, you create many debates as to what subjects to take out.
- Pg 11 leads to misconception that all standards take equal amount of time and resources. Some standards take years, some one lesson. Take caution.

Rodger Bybee – It's important to confront our own misconceptions about how long it might take to learn content in certain standards.

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Harold Pratt – Specificity, accessibility, measurability are all very similar. It is a question of the degree of detail. Addressing what to do with standards rather than the intrinsic quality of the standard itself is also important.

Panelist Discussion of Possible Constraints in the Review Process:

- I've been through this process before, and there was a realization that the recommendations were constrained by format restrictions from the math, reading standards. We need to have the constraints be made up-front and available.
- We don't want to create ideas that can't end up doing.
- What's an example of a constraint?
- We looked at the document and made a number of recommendations (2005) that weren't implemented because of constraints from OSPI.
- Jeff Vincent: The State Board won't make constraints.
- David Heil: We haven't been told of constraints. But we want to know them if they're there (directed at OSPI).
- The constraints (in the previous process) were in formatting, use of verbs, etc.
- Jeff Vincent: The State Board is very cognizant, and really wants something that works for science. The State Board will fight for efficacy.
- David Heil: We are currently in different climate/legislature. The State Board really wants to improve curriculum and assessment. They are implementing a check and balance review. We are only providing recommendations not a rewrite of the document. The intent is to have checks and balances – not do all the work and then find out later that there were constraints.
- Mary McClellan (Observer from OSPI) – OSPI will implement what SBE decides. It's great that Pinky posed question and it is important to be aware that it could be issue and have prompt answer. I have not heard anything on that topic.
- I hope we can make significant mark because we all spent lots of time. What is expected of us between now and the next meeting?
- Harold Pratt: If you have Benchmarks, Chapter 14 addressing this issue provides an excellent discourse on standards and issues.
- David Heil: Our meetings are strategically located for interim reports. The strengths and weaknesses analysis is an important first step for SBE. We will be reviewing documents, background reports, and reference documents. In February we will be reporting on the review of standards after the Expert Review Panel has been convened. We will send you information to review in advance of the next meeting.

Close of Meeting
Jeff Vincent, Washington Science Advisory Panel Chair

Jeff Vincent closed the meeting by discussing the importance of taking a holistic approach to the review and posing the questions

- How do we impact teacher development and instructional materials?
- How do we pull it all together and make changes and get things done?

Washington State Board of Education

Working to Raise Student Achievement Dramatically

Science Standards Review for the Washington State Board of Education

WA Science Standards Review Advisory Panel Meeting

December 18, 2007

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Harold Pratt *Co-Director*

Kasey McCracken *Project Manager*

Second Substitute House Bill 1906 As Amended by the Senate -- Passed Legislature -- 2007 Regular Session

"The state board of education shall appoint a mathematics advisory panel and a **science advisory panel** to advise the board regarding essential academic learning requirements, grade level expectations, and recommended curricula in mathematics and science and to monitor implementation of these activities. In conducting their work, the panels shall provide objective reviews of materials and information provided by any expert national consultants retained by the board and shall provide a public and transparent forum for consideration of mathematics and science learning standards and curricula."

PROJECT TIMELINE/OVERVIEW

November December 2007	January 2008	February March 2008	April May 2008
1. Research and review relevant documents, establish criteria for benchmark selection, summarize preliminary findings. 2. 1st WA Panel Meeting. 3. Develop methodology and instruments to support expert review.	4. Submit preliminary report to SBE. 5. Facilitate expert review of Washington Science Standards.	5. Analyze/interpret results of expert review & prepare recommendations. 6. 2nd WA Panel Meeting. 7. Submit interim report to SBE.	8. Facilitate public input into the Science Standards Review. 9. 3rd WA Panel Meeting. 10. Submit final report to SBE.

HIGHLIGHTS FROM THE STANDARDS MOVEMENT

The 1980s

- A Nation At Risk (1983)
- National Council of Teachers of Mathematics (NCTM) Standards (1989)
- Science for All Americans (Rutherford and Ahlgren, 1989)

The 1990s

- Benchmarks for Science Literacy (AAAS, 1993)
- WA EALRs developed (1993)
- National Science Education Standards (NRC, 1996)

The Early 21st Century

- WA GLEs developed (2005)
- National Assessment of Educational Progress (NAEP) Science 2009

THE POWER OF STATE STANDARDS FOR SCIENCE EDUCATION

- The power of state standards lies in their capacity to change fundamental components of the educational system.
- State standards for science education provide a perspective on educational improvement that emphasizes what all students should know and be able to do.
- Implementing state standards facilitates greater coherence among educational components.
- The content of standards emphasizes fundamental science concepts and basic processes of scientific inquiry.
- The standards provide the basis for a curriculum that is educationally coherent, developmentally appropriate, and scientifically accurate.
- State standards should facilitate alignment of state, district, and classroom assessment practices with curriculum goals and instructional approaches.

PITFALLS AND PRECAUTIONS

- Assuming Content Standards Are Curriculum
- Using Content Standards to Describe Educational Experiences
- Confusing Content Standards and Performance Standards
- Stating Content Standards as Behavioral Objectives
- Confusing Content Standards and Curricular Topics

PITFALLS AND PRECAUTIONS

continued

Assuming Content Standards Are Curriculum

Example

The following does not necessarily describe a sequence for instruction:

- Properties and changes in properties in matter.
- Motions and Forces.
- Transfer of Energy.

(from NSES, Physical Sciences, Grades 5-8)

PITFALLS AND PRECAUTIONS

continued

Using Content Standards to Describe Educational Experiences

Example

The following describes an educational experience:

- Students will investigate life cycles of organisms.

PITFALLS AND PRECAUTIONS

continued

Confusing Content Standards and Performance Standards

Example

The following illustrates the difference between content and performance standards:

Content Standard
Properties of Objects and Materials

Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances. Those properties can be measured using tools, such as rulers, balances, and thermometers.

(from NSES, Physical Sciences, Grades K-4)

Performance Standard

Students will use rulers, balances, and thermometers to describe properties of objects and materials.

PITFALLS AND PRECAUTIONS

continued

Stating Content Standards as Behavioral Objectives

Example

The following illustrates a statement of a standard as a behavioral objective:

- At the completion of grade four, all students will be able to identify three kinds of rocks.

NSES example.

As a result of activities in grades K-4, all students should develop understanding of:

- The Characteristics of Organisms.
- Life Cycles of Organisms.
- Organisms and Environments.

PITFALLS AND PRECAUTIONS

continued

Confusing Content Standards and Curricular Topics

Example

The following illustrates curricular topics:

- Light, Heat, Electricity, Magnetism
- Marine Biology
- Environmental Problems: Populations and Resources
- Rocks and Minerals

KEY CONSIDERATIONS

Should the standards be framed as curriculum standards (such as NSES and the AAAS Benchmarks) or as performance standards?

KEY CONSIDERATIONS

How should attention to the following be balanced with comprehensive coverage of science content?

- Logical/critical thinking
- Inclusion of topics such as History & Nature of Science
- Inquiry

KEY CONSIDERATIONS

Should Washington consider changes to how the Standards are framed and formatted?

- Grain Size: How much depth of information is desired?
- Amount of Material: Are there concerns about the "inch deep and mile wide" phenomena?"
- Are grade-span standards adequate?

SELECTION OF BENCHMARK STATES/NATIONS

Benchmark States:
- California
- Colorado
- Massachusetts

Benchmark Nations:
- Finland
- Singapore

Criteria Used in Selection:
- New Economy Indicators
- Comparison studies of state standards reviews (Education Week, Fordham Institute, AFT)
- National & International Assessments (NAEP, TIMSS & PISA)

STATE COMPARISONS

State/Nation	2002 New Economy Rank	Most Recent Year Updated*	College Readiness Defined*	Regular Timeline for Revising*	Quality Counts 2006 Overall grade	Fordham Science	Levels Mtg AFT Criteria for Science Alignment	2005 NAEP Grade 4 (Average Score)**	Direction of Change from 2000 to 2005**	2005 NAEP Grade 8 (Average Score)**	Direction of Change from 2000 to 2005**
Massachusetts	1	2006-07	NO	NO	A	A	e, ms, hs	160		161	+
Washington	2	2005-06	NO	YES	B	C	e, ms, hs	153	N/A	154	N/A
California	3	1998-99	YES	NO	B+	A	e, ms, hs	137	+	136	+
Colorado	4	2005-06	NO	YES	B	B	hs	155	N/A	155	N/A
Maryland	5	2000-01	NO	YES	A-	B	e, ms, hs	149	+	145	
New Jersey	6	2002-03	YES	NO	B+	B	e, ms, hs	154	N/A	153	N/A
Connecticut	7	2004-05	NO	NO	B-	C	NONE	155		152	
Virginia	8	2002-03	NO	YES	B	A	e, ms, hs	161	+	155	+
Delaware	9	1994-95	NO	NO	B+	C	NONE	152	N/A	152	N/A
New York	10	1995-96	YES	YES	A	A	e, ms, hs	N/A	N/A	N/A	N/A

NATIONAL COMPARISONS

State/Nation	TIMSS 2003 Grade 4 Avg. Science Scale Score	TIMSS 2003 Grade 8 Avg Science Scale Score	PISA 15 yr olds Average Science Scale Score	Education Expectancy 2004*	Percent of Population in Enrolled in Secondary Education*	Expenditures on Education as a percent of GDP*
Singapore	565	578	no data	N/A	N/A	N/A
Chinese Taipei	551	571	no data	N/A	N/A	N/A
Hong Kong	542	556	539	N/A	N/A	N/A
Japan	543	552	548	N/A	n/a	n/a
Australia	521	527	525	20.7	85%	3.7%
United States	536	527	491	16.9	82%	5.7%
New Zealand	520	520	521	19.1	95%	6.8%
Finland	n/a	n/a	548	20	94%	6.5%
Intl Ave	489	473		17.4 (OECD)		5.5% (OECD)

STANDARDS REVIEW CRITERIA

1. Clarity
2. Rigor
3. Content
4. Coherence from grade to grade
5. Balance
6. Depth
7. Specificity
8. Accessibility
9. Measurability

PRELIMINARY DEFINITIONS OF STANDARDS REVIEW CRITERIA

Clarity

The standards are written in clear prose without jargon and with a minimum of technical vocabulary. Where technical terms are necessary, the language is clarified through definitions and examples.

Rigor

The standards at each level are written at an appropriate level of rigor for the grade level to which they are assigned.

The standards include abilities of inquiry that allow students to acquire the content called for.

Content

The standards include the most important fundamental concepts in each of the sciences.

Inquiry standards are included at each grade level.

PRELIMINARY DEFINITIONS OF STANDARDS REVIEW CRITERIA

Coherence from grade to grade

The standards build on the knowledge and skill from the previous grade levels.

Repetition of content from one grade level to the next levels is avoided.

The mathematics required for the standards is coordinated with the mathematics standards for that and earlier levels.

Balance

The standards provide a balance across the major disciplines and between the abilities of inquiry and subject matter content.

Depth

The number of standards assigned at each grade level allows them to be developed with a depth of understanding. The standards avoid the characteristic of being a "mile wide and an inch deep".

PRELIMINARY DEFINITIONS OF STANDARDS REVIEW CRITERIA

Specificity

The language in each standard is specific enough to communicate the nature and level of understanding or ability.

The amount of knowledge or skill in each standard (grain size) is consistent throughout the document and contains an amount of content or skill to allow specificity of language and definition of outcome.

Accessibility

Although rigorous, the standards contain enough detail to allow curriculum developers and teachers to develop instructional materials and strategies for use with students. The number of standards allow schools and teachers to address all of them in a normal school year.

Measurability

The standards provide enough detail to describe the type and level of performance that allows the development of assessment instruments.

METHODOLOGY FOR USING THE NINE CRITERIA

- Develop scoring guides for each of the definitions.
- Establish inter-rater reliability for the use of scoring guides by the panel of experts.
- Use scoring guides to rate the Washington Science Standards and the Science College Readiness Definitions and compare them to the reference standard documents.
- Include qualitative comments and exemplary standards from the reference documents when useful.