Washington State Science Learning Standards Transition Project

Bias & Sensitivity Process

June 27, 2013

RELEVANT STRATEGIES

Relevant Strategies LLC partnered with the Washington Office of the Superintendent of Public Instruction to identify effective strategies for implementing the Next Generation Science Standards (NGSS) in a bias-free and culturally sensitive manner. Nearly forty participants gathered to discuss effective classroom, home & community, and school based supports for implementing the standards. The teams used current research and their own experience to describe specific strategies for implementation of the NGSS to support diverse student populations.

SUPERINTENDENT OF PUBLIC INSTRUCTION WASHINGTON

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Table of Contents

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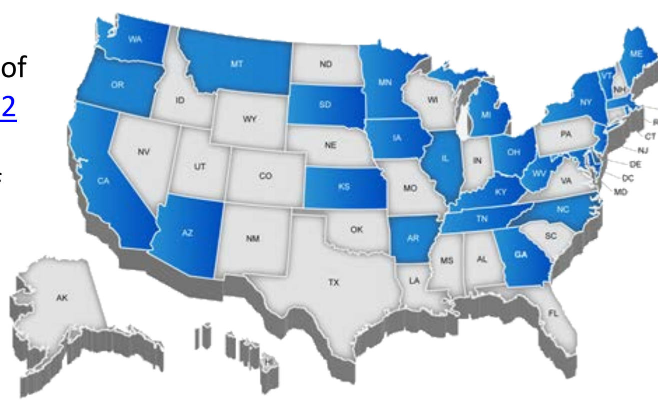
1 Executive Summary

Relevant Strategies LLC partnered with the Washington Office of the Superintendent of Public Instruction (OSPI) to identify effective strategies for implementing the Next Generation Science Standards (NGSS) in a bias-free and culturally sensitive manner. Nearly forty participants gathered to discuss effective classroom, home and community, and school based supports for implementing the standards. The teams used current research and their own experiences to describe specific strategies for implementation of the NGSS to support diverse student populations.

Under current Washington State law (RCW 28A.655.070), OSPI has the responsibility to develop and maintain Washington's academic learning standards consistent with the goals outlined in the Basic Education Act, RCW 28A.150.210. This includes periodic review and possible revision of the standards. Prior to adopting state learning standards in any subject area, OSPI's process includes several key components that include reviewing and vetting the draft standards with key statewide stakeholder groups, conducting comparisons of previous state learning standards with the revised standards, and conducting a bias and sensitivity process to gather recommendations for implementing the standards in a culturally sensitive and bias-free manner. These steps are conducted prior to adoption to allow OSPI and other statewide partners involved with developing transition and implementation plans and resources to gather specific recommendations on critical issues related to implementing the new standards.

In 2010, the National Research Council, the National Science Teachers Association, the American Association for the Advancement of Science, and Achieve, Inc. began a three year process to develop Next Generation Science Standards (NGSS). The process consisted of two steps beginning with the crafting of *A Framework for K-12 Science Education* which sets forth a contemporary vision of science education reflective of current research on science, engineering, and science learning thus identifying the science that all K-12 students should experience.



The second step was managed by Achieve, Inc. and included a competitive process to select a coalition of states prepared to draft a comprehensive set of K-12 standards based on the *Framework* principles. In 2011, Washington was selected to serve as a one of the lead states in the national coalition to develop the NGSS.

Since Washington had just engaged in an extensive review of the Common Core State Standards (CCSS) for English Language Arts and Mathematics, the state legislature agreed that it made sense for OSPI to also become involved with the development of NGSS in order to inform our state's next adoption of new student learning standards for science (per RCW 28A.150.210 and 28A.665.068).

Between fall 2011 and winter 2013, OSPI and state science partners including the nine regional Educational Service Districts (ESDs) and LASER (Leadership and Assistance for Science Education Reform), with grant support from Battelle/Pacific Northwest National Laboratories and Boeing, convened groups of educators to provide input on the two public drafts of the NGSS. In addition to two public drafts, lead state only releases of the NGSS were reviewed by multiple advisory committees which included leaders in science, science education, higher education, informal education, business and industry.

Once the NGSS were finalized in April 2013, OSPI began the review process necessary to inform the state's adoption of the standards. The process includes the following steps:

1. Completing a thorough review and comparison of the NGSS with Washington's 2009 Science Learning Standards.
2. Completing a bias and sensitivity process to inform implementation of the NGSS in a culturally sensitive and bias-free manner.
3. Developing a plan to guide initial transition to the standards once they are adopted.

Through a competitive bid process, OSPI selected Relevant Strategies to assist with the overall coordination and facilitation of both the standards comparison and bias and sensitivity processes. This report describes the process work intended to identify effective strategies for implementing the NGSS in a bias-free and culturally sensitive manner.

In May 2013, OSPI invited over 70 Washington State educators to participate in the bias and sensitivity process. Of the invitees, nearly 40 participants gathered to discuss effective classroom, home & community, and school based strategies for implementing the standards, many of whom had participated in a similar process in 2011 with the Common Core State Standards for English language arts and mathematics.

Throughout their development process, the NGSS received exhaustive review and modification to eliminate bias. Achieve, Inc. engaged a Bias and Sensitivity committee and national experts from the start of the process to inform every step of development. For the Washington NGSS Bias and Sensitivity Process, participants used current research and their own experience to describe specific strategies for effective and inclusive implementation of the standards, targeting diverse student populations based on primary accountability groups identified in the No Child Left Behind Act of 2001 and the Elementary and Secondary Education Act (ESEA) of 2003 Section 1111(b)(2)(C)(v). The identified groups include:

- Economically disadvantaged students
- Students from major racial and ethnic groups
- Students with disabilities
- Students with limited English proficiency

Appendix D of the NGSS extends diversity further by adding three groups that are critical to consider:

- Gender

- Students in alternative education
- Gifted and talented students

This report outlines specific strategies for engaging all students in learning science. The target audiences for this report are science educators, curriculum specialists, educational leadership, policy makers, and anyone else who is working to reduce the achievement gap in science and seeks to make science relevant, interesting, and engaging for all students.

The information contained in this report represents a subset of the potential strategies for engaging students with one or more diversity characteristics who have historically been underserved in science education. The strategies are neither exhaustive nor prescriptive. They represent current thinking in science education research and the personal experience of the 40 Washington educators, scientists, and curriculum specialists who contributed to this report. The intent of the report is to spur creative thinking to involve diverse student groups in their science education with the expectation that engagement is the first and most important step to reduce the achievement gap and open new college and career opportunities for all students.

The format for the day-long work session involved two major components: the development of a shared understanding of issues facing diverse student learners, as presented by four regional experts; and the identification of strategies to engage all students in learning and applying science. The four experts volunteered to share their experiences of working with students from major racial and ethnic groups, economically disadvantaged students, and students with limited English proficiency. They became the voice of these student populations. During the afternoon, participants identified strategies for engaging diverse student populations. The strategies were organized into three areas based on current research presented in Appendix D of the NGSS:

- Effective Classroom Strategies
- Home and Community Connections to School Science
- School Resources for Science Instruction

Perhaps the most important finding from this work is that there are many effective classroom, home and community, and school-based strategies to engage all students in learning and applying science. Many of the strategies are simple in nature, but profound in their impact: such as reaching out to tribal elders and community members to enlist their support to encourage their grandchildren and other students to persevere, learn, apply, think, and grow in their confidence and knowledge, so that they are ready for 21st century careers in science, technology, engineering and mathematics.

2 Process Overview

This section describes the process used for the day-long session. Participants brought a strong working knowledge of teaching diverse student populations, and a solid understanding of the NGSS. Many of the participants had prior experience with other bias and sensitivity review processes.

Relevant Strategies and OSPI used the process outlined in Section 2.1 to identify successful strategies. The process involved reviewing current research on science education, interacting with experts presenting their ideas about teaching diverse learners, and collaborating in small groups to identify strategies to effectively engage diverse students in science education.

2.1 Training & Orientation

Participants read materials in advance of the work session. The pre-reading included:

- *NGSS Appendix D – All Standards, All Students: Making Next Generation Science Standards Accessible to All Students*.
- *Effective Science Technology Engineering and Mathematics (STEM) Education Strategies for Diverse and Underserved Learners*, by Okhee Lee.
- *Next Generation Science Standards*.
- *A Framework for K12 Science Education, Equity and Diversity* chapter.

With this background, participants were able to listen and interact with four educators with expertise involving diverse student populations as they presented their advice about teaching science to diverse learners. Each presenter had a unique perspective. See *Section 3.1 Real World Perspectives* for more information about the presentations. After each presentation, participants had the opportunity to ask questions and interact with each other.

The facilitator introduced the purpose and intent of the work, described the accountability groups as outlined in the *Elementary and Secondary Education Act* (ESEA) of 2003, and gave directions about the use of the data collection form, which is shown in this report's Appendix A: *NGSS and Equity Assessment Tool*.

It is important to remember that none of the primary accountability groups are homogenous, and it is dangerous to distill the richness of what an individual brings to the world to a few descriptors. The number one success factor for engaging students in science education is to understand what motivates that person, and cultivate his or her interests and enthusiasm appropriately. In addition, it is important to note that diversity does not exist in a vacuum. For example, students with limited English proficiency may also be members of a major racial or ethnic group, or be gifted and talented, or have any other of a number of diversity characteristics. Participant teams chose a primary accountability group, and were encouraged to extend the diversity characteristics to create a more realistic scenario for which to describe engagement strategies. Participants could further extend their scenario by describing their selected diverse student group in any manner they chose. Figure 1 shows a section of the instrument used by the teams to describe their identified student population.

Select & circle a primary accountability group below. Then select zero, one or more additional student diversity characteristics in that row.		Additional Student Diversity Characteristics						
		Gender	Students in alternative education programs	Gifted and talented students	Economically disadvantaged students	Students from major racial and ethnic groups	Students with disabilities	Students with limited English proficiency
Primary NCLB Accountability Group	Economically disadvantaged students							
	Students from major racial and ethnic groups							
	Students with disabilities							
	Students with limited English proficiency							

Figure 1. Grid used to identify primary accountability group (left column), and additional diversity characteristics (top row). Participants could further describe their selected accountability group in any way they wished.

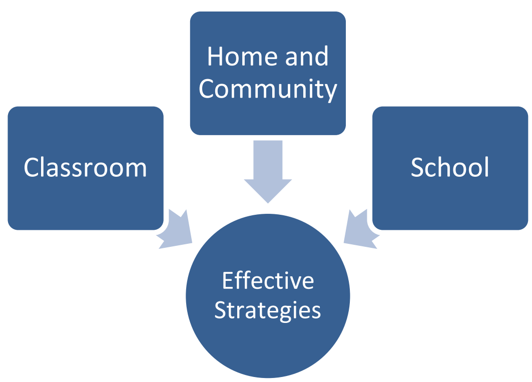
2.2 Overview of Work

During the first part of the day, participants established a common understanding of the various ways to engage all students in science. All of the presenters interactively involved the entire group, and free ranging discussions ensued.

After the four presenters completed their work, participants formed seven teams of up to six people to develop a diversity scenario and identify engagement strategies for the classroom, home and community, and school settings for the student groups described earlier.

Each of the teams chose a primary accountability group based upon their experience and expertise. Then, they extended the diversity characteristics of their selected accountability group to more realistically mirror the student population in Washington State.

The teams also selected a grade, disciplinary core idea and topic (from the NGSS) to ground their work. A question was posed to each team: How could the standards be taught in a way that addresses the needs of students from diverse backgrounds? The participants then identified and vetted effective strategies to engage diverse learners in three domains, classroom, home and community, and school.



The identified effective **classroom** strategies involved connecting science education to students' sense of place, applying their funds of knowledge and cultural practices, and using project based learning. Strategies also included using culturally relevant pedagogy, community involvement and social activism, role models, providing accommodations and modifications for students with disabilities, and adopting language support strategies, home language support, and home culture connections. In addition to these strategies identified by the committee, many other classroom strategies exist.

Strategies around effective **home and community connections** to school science start with a mind-shift of identifying resources and strengths in the family and home environments of diverse student groups. Other strategies include involving parents and extended family, defining problems and designing solutions for community projects in local neighborhoods, and focusing on science learning in informal environments.

Strategies around **school-based resources** to support science learning fall into three categories:

- Material resources – curricular materials, professional development, supplies, and other expenditures.
- Human capital – content and cultural knowledge and leadership.
- Social capital – norms and values surrounding learning, teaching, and relating to others.

Each of the teams described specific strategies that would be effective in engaging students in their selected primary accountability group. Many of the identified strategies were congruent with the strategies outlined in *Appendix D: All Standards, All Students from the Next Generation Science Standards*. However, some of the strategies were unique or more detailed than those outlined in the Appendix.

Each team presented their findings, and the whole group responded to their ideas. The next section of this report describes the experts, their advice, and the findings of the committee.

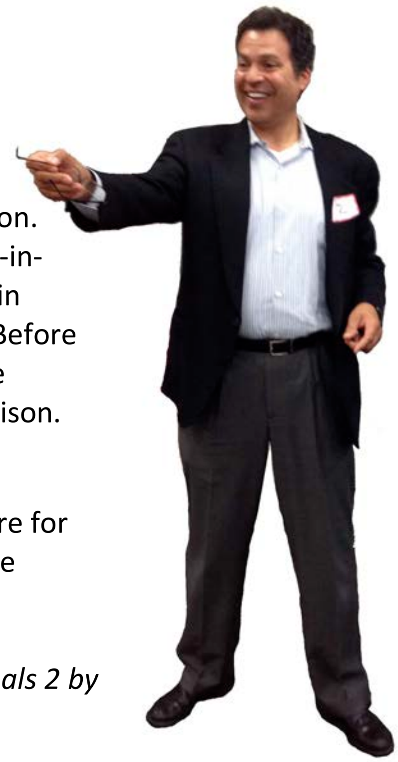
3 Recommended Implementation Strategies

This section outlines the many potential implementation strategies and recommendations for implementation of the NGSS gathered through the May Bias and Sensitivity Process. *Section 3.1* covers recommended strategies from the expert presenters. The remainder of *Section 3* focuses on specific strategy ideas for each of the four primary accountability groups, as identified by the participants.

The strategies listed are examples. Many more strategies exist. District leaders and educators are encouraged to expand upon these strategies when implementing NGSS to better address the unique needs and circumstances of their schools and communities. It is also important to remember that while students may belong to one or more identified diversity groups, each person is unique, and not all strategies for a particular accountability group will work for all students within that group. Knowing the culture, knowing the students, and knowing the community is the key to effectively engaging students and sparking a lifelong interest in science.

3.1 Real World Perspectives

3.1.1 José Rios



Biography

Dr. Rios works with pre-service teachers at the University of Washington. While on sabbatical this year, he spent several months as the Scientist-in-Residence at Adams Elementary in Seattle. Dr. Rios received his Ph.D. in Science Education/Zoology from the University of Wisconsin in 1995. Before coming to the UW in 1997, he served as Outreach Coordinator and the Summer Science Institute Director at the University of Wisconsin-Madison.

Perspective from the Elementary Classroom

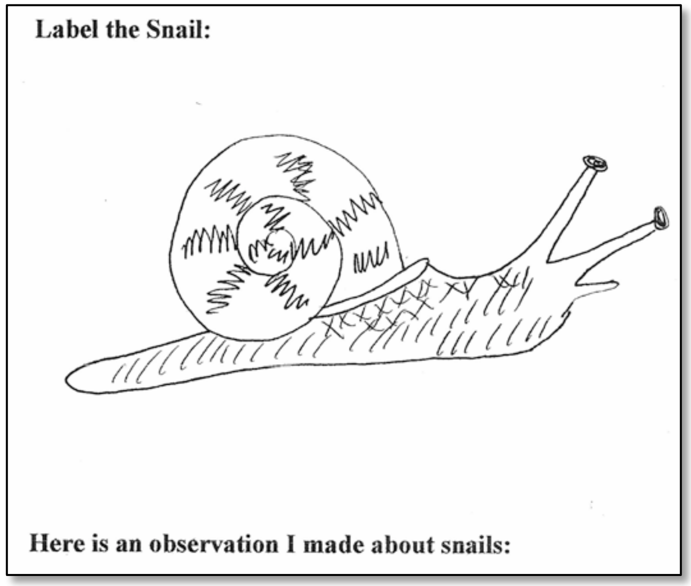
Dr. Rios shared two examples of classroom projects and how to prepare for them ahead of time, especially with students who are English Language Learners (ELL).

Example 1: *Project from a FOSS (Full Option Science System), Kit: Animals 2 by 2. This example is for grades K-2.*

The task was to draw and label a snail. Primary grade students might take 3-5 days to generate and correctly label a drawing. Dr. Rios described how to integrate ELL strategies into the teacher's preparation to use the module.

He made the following suggestions:

- Scaffold the worksheets.
    - Use precut labels for parts of the snail; have students draw lines from the label to the correct part.
    - Use prompts to model expectations and vocabulary such as
        - I saw _______. The color of the shell is _________.
- Assess which students need more help and have the tools in place.
- Fade out assistance as students gain proficiency in the task.



Example 2: *Teaching Unit on Sound.*
Here is a formative assessment question that could be very difficult for ELL students to accomplish:

> *Describe what the slide whistle system produces when it is functioning properly.*

When asked for feedback about the original directions, participants indicated the statement had no context for English Language Learners, and there were too many academic words. The participants felt the directions could be easily simplified. Dr. Rios offered these three steps to do so:

- Break the assessment down.
- Identify key words.
- Substitute simpler words to get at the same meaning:
    - *What did you do to make the whistle work?* (Blow into it)
    - *What comes out of the whistle when it is working?* (A sound)

In addition, Dr. Rios discussed the Pre-Instructional Phase, Instructional Phase, the Assessment Phase of any instructional unit (e.g. drawing the snail), and some particular thinking tasks for each stage.

> *Often we present material as written, showing fidelity to the curriculum instead of the student, which can result in the failure to add context. Do the pre-work to anticipate this.*
>
> *– José Rios*

He presented several recommendations for each stage:

Pre-Instructional Phase:

- Collect student information.
- Create multiple pathways for completing assignments.
- Provide all assignments and assessment criteria up front.
- Create reading guides and/or notes.
- Consider a variety of instructional strategies for learning the content.

Instructional Phase:

- Discuss expectations explicitly and model behavior.
- Use visual aids (summaries, charts, diagrams and Internet).
- Structure all activities (individual and group).
- Create time for debriefing and reflection.

Assessment Phase:

- Create assignment sheets with expected outcome and rubrics.
- Provide examples from past assignments.
- Use multiple avenues for feedback.
- Use low stakes assignments.
- Create checklists for long assignments.
- Give short quizzes instead of long exams, short instead of long papers.

Post Presentation Discussion and Feedback

Some committee members commented that students with academic preschool experience, such as Jumpstart, do better with the types of tasks Dr. Rios described in the two examples. Privileged (economically advantaged) students who also have had preschool experience using letters, drawing and writing are better prepared to engage in these types of tasks.

A workshop participant commented about declarative knowledge types of prompts. "Some kids are familiar with that method of question and answer. A quick answer from a student may lead to a [label of] false positive — a student interested in science; while a student who fails to answer that question quickly may be misidentified. It could just be that their home environment has familiarized them with that type of structure."

A key learning from Dr. Rios' presentation was the importance of showing fidelity to the students instead of the instructional materials by understanding what the students need in order to demonstrate their knowledge. Typically, scaffolding the learning experience, relating to the student's contextual knowledge, and providing examples are key success factors to ensure English language learners can demonstrate what they know.

3.1.2 Phyllis Harvey-Buschel

Biography

Dr. Harvey-Buschel is the project manager, governmental relations and curriculum director for the Washington MESA (Mathematics Engineering Science Achievement) program at the University of Washington (UW). Dr. Harvey-Buschel earned three Master's degrees, an MSc (Plant Biology) from the University of the West Indies, an MSc from George Mason University and an MAT from Trinity University-Washington. She received her Ed.D. from Bowie State University in Education Leadership in 2009. She joined the University of Washington the same year.

Dr. Harvey-Buschel described how the MESA program meets the needs of its students. MESA is a partnership that brings leaders from higher education and business into the classroom to engage underrepresented K - 12 students to pursue STEM (Science Technology Engineering and Math)-related careers. Students accepted in the MESA program are classified as underrepresented according to federal definitions. They might be economically disadvantaged, African-American, young women, Native American, Latino, or Latina. In the UW MESA program, no one culture is dominant.

Dr. Harvey-Buschel observed, “To me, an immigrant metaphor has always seemed to provide just the right terms to describe both the challenges and opportunities offered to MESA students with the NGSS. Whether it is “charting a new course in a new school or at work,” an immigrant needs to have the patience required to navigate different cultures and behaviors”.

In order to chart this new course, it is valuable to give students the opportunity to assess their interests, and then ask ‘Who’ and ‘What’ in order to pursue those interests.

MESA uses the ‘Buckets’ approach as shown in Figure 2 which helps to separate and simplify specific contexts.

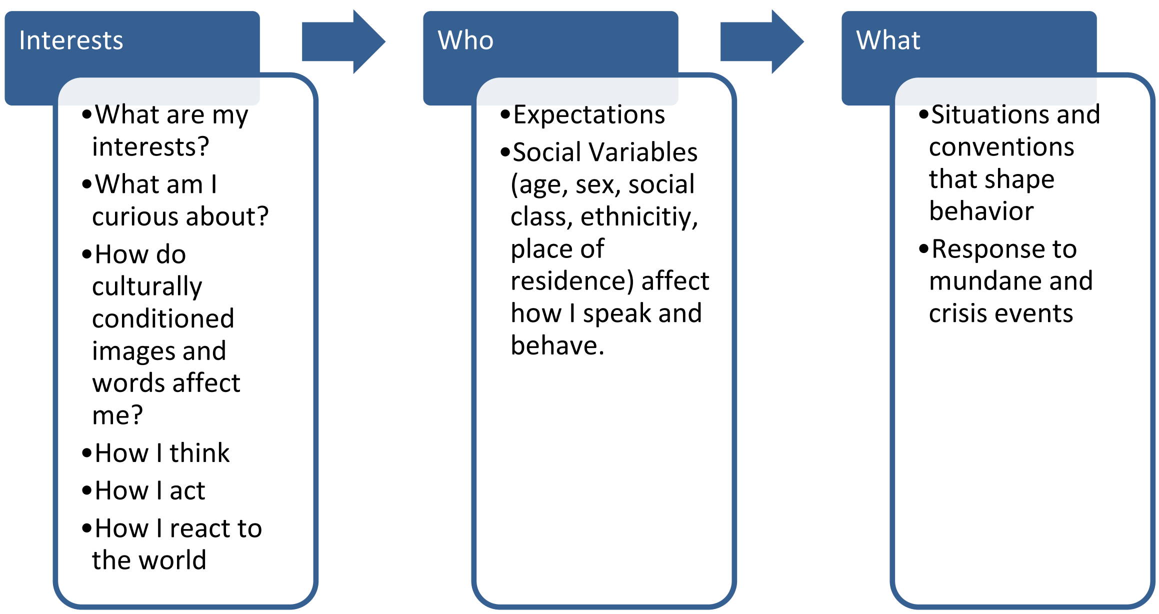


Figure 2. MESA ‘Buckets’

Harvey-Buschel specifically emphasized the engineering standards in the NGSS and how these standards are related to the work MESA does with students. “The engineering aspects of the NGSS standards make for a good and relevant fit among MESA students.” She also noted four additional characteristics of MESA success.

Teamwork

- MESA establishes teams in a comfortable social setting.
- MESA students already come to the program with cultural values around collaboration; they are often not comfortable competing as individuals.

Presentations

- MESA students learn real world skills from their presentations.
    - Middle school students present their designs to other students and to judges.
    - High school students defend their designs in front of a panel of judges drawn from the community.

Home and Family Connections

- Acceptance in MESA begins with a formal interview and a home visit. A MESA coordinator visits the home of the student to describe services and opportunities.
- Groups called Powerful Parents ensure that parents are involved in all communications. One parent takes the lead to share news and events to their "crew" of parents, (similar to Link Crew).
- Family engagement in events can often lead to the next sibling or next generation involvement in the program.

Background Knowledge

- Identify what students know. Do we value or devalue her/his prior knowledge?
- Anticipate examples in learning materials that may assume prior knowledge that students may not have. For example, sports such as archery and skiing may not be good examples for some students. Consider appropriate substitutions in advance (e.g. skating for skiing) when teaching concepts like kinetic energy.

Dr. Harvey-Buschel shared a multi-step process designed to guide a student through the steps of investigating a career interest.

Build Career Interest

- Example: A student says, "I want to help people and these are people I see in my community, so I want to be a health/nurse's aide."
- Show them other career options that use the same skills. Let students know they will still help people, and they will be paid more!
- Bring in speakers from industry who can help to broaden students' interest and provide valuable information beyond the field of entry-level jobs.

Motivate

- Offer successful role models from similar backgrounds to help motivate students. Show relevance to life and community.

Connect

- Form partnerships between students and respected community members. This is a two-way street where students receive guidance and support from their advisors, and the community members form a connection to the students and school.

Inspire

- Use a prompt: I can see myself ________________________ in the future.

Offer successful role models from similar backgrounds to help motivate students. Show relevance to life and community.
– Phyllis Harvey-Buschel

Mentor

- Provide someone who can show a student how to succeed and be ready for the academic or career opportunities.
- Help students implement their written plan (which includes financial implications of choice)

Post-Presentation Discussion and Feedback

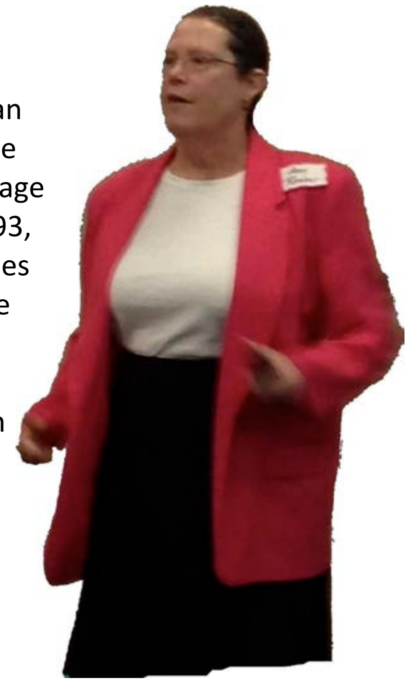
A workshop participant shared a community science walk exercise that worked with pre-service teachers, which could also be a model for students and families. The pre-service teachers went to the neighborhoods around their school and visited community businesses to identify how science was used in different environments. Field trips create opportunities to model science language with authentic community connections.

In response to a question about community mentors, Harvey-Buschel described an example of a recent MESA project in which community mentors were invited to participate. "How do we engage and mentor kids in computer science? First we created the task, 'build a mobile app', to gain their interest. We called upon Microsoft, Amazon and Code Seattle employees for help. One challenge is how to get volunteers from initial interest to active participation. Many professionals find it difficult to get away from work to volunteer during school hours. We have to go beyond having a physical presence and rely on technology like Skype to bring mentors and volunteers to students using a virtual presence."

Another participant had used *The National Lab Network* to find mentors, which uses online tools to match scientists with students. See http://www.nationallabnetwork.org.

A key learning from Dr. Harvey-Buschel's presentation involves starting with a student's core interests and building upon those interests in a structured manner to engage students in their learning process.

3.1.3 Ann Renker



Biography
Dr. Ann Renker received her Ph.D. in anthropology from The American University in Washington, D.C. in 1987. Previously, she worked for the Makah Cultural and Research Center as Director of the Makah Language Program, and later, as the Executive Director of the facility. Since 1993, Renker has worked for the Cape Flattery School District which provides the public education services for the Makah Reservation. She was the ESL teacher and coordinator of the bilingual education program at Neah Bay High School in the Cape Flattery School District until she moved into administration in 2002. Renker has been the Markishtum Middle School and Neah Bay High School principal since 2005

Neah Bay High School Demographic Information
Dr. Renker shared demographic information about her school with the workshop participants.

- 98% are enrolled tribal members.
- 66% are eligible for free and reduced lunch.
- In 2005 just 4% of the tenth grade students passed state math exam, while in 2013, 100% of the 10th grade students passed the state math requirement.
- In 2005 no students passed the science exam (WASL at that time) and in 2012, 56% of the tenth graders passed the end of course biology exam.
- According to the Office of Minority Affairs at the University of Washington, “There are more Makahs at UW than any other Tribe in the state.” 86% are from Neah Bay High School.
- The school has direct connections with the Makah tribe, which include listing tribally employed members with STEM-related jobs in their STEM registry. When these members are invited to come present to the school, they are able to take paid time to do so.

College Readiness for All
Dr. Renker has been successful in her years as an administrator by conveying the “college readiness filter,” as she calls it, to the entire school community. In her view, success for all students *requires* the active participation of the wider community, including extended family members. This is an ongoing effort and is built on community norms establishing high expectations for all students. She identified certain factors that contribute to this success:

- Identify cultural axioms that may initially be thought of as barriers and, working with cultural leaders, redefine them to promote educational achievement. Three examples of this are an overnight field trip, excusing homework from the culture of visiting, and reminding students and the community about historic planning practices of the Makah 500 years ago.
    - In a deviation from cultural practice, a school sponsored science field trip has a three-night overnight stay away from family. Once the extended family understood the

linkages to the 'college readiness, challenging math and science for all' filter, they became more supportive of the field trips.
    - The culture of visiting meant that in the beginning of Renker's tenure, students might be told they were going to Grandma's, so they could not get their homework done. Now, with the elders fully invested in the college readiness goal, a student texts Grandma 'I am doing my homework', when they cannot visit in person. Grandma is proud of them, understands what they are doing, and might even text back to ask about homework progress.
    - Planning ahead and being organized were norms for Makah tribal members before contact with non-Indians, as they hunted whales, fished for a variety of maritime species, constructed cedar longhouses, carved ocean-going canoes and created specialized baskets and tools from the natural resources in their environment. Planning ahead and being organized was essential to survival 500 years ago. It remains essential to the Makah today; it's just that the circumstances have changed.
- Students must have some fluency in math and science in order to be successful in post-secondary education. Whether a student's path leads immediately to higher education or the military; math and science classes are required for admittance and must continue to be taken even in one's senior year of high school. These classes are for everyone.
- Economics: The school and the tribe need to grow STEM skills internally. Right now tribes are importing this talent in science, math and technology.
- Civics: All literate educated people need to be able to have conversations about science and math.

She believes that a college readiness filter offers:

- Direct instruction in behavioral and academic skills that does not involve pejorative comments about the home culture.
- STEM emphasis without detracting from the importance of other subjects.
- Access to the best of the American Dream.
- Experience with perseverance – "Hard work overcomes obstacles".

> *Right now tribes are importing this talent in science, math and technology.*
>
> *– Ann Renker*

Renker and her team are committed to research-based strategies:

- Her team used Carol Dweck's book *Mindset: The New Psychology of Success* for 3 years of community involvement and education around this way of thinking. They teach the growth mindset instead of a fixed mindset.
- The tribe established a Makah Student Incentive Program (based on work of Roland Fryer 2010). Students receive a $25 award for each state test passed, and they earn a bonus if all tests are passed. See *Financial Incentives and Student Achievement: Evidence from Randomized Trials*, Roland G. Fryer, Jr., Harvard University Education Innovation Laboratory and the National Bureau of Economic Research, April 8, 2010. http://www.edlabs.harvard.edu/pdf/studentincentives.pdf.

Student Involvement and Leadership

Renker mentioned examples from her school that were noteworthy for their empowerment of students.

- The Associated Student Body (ASB) at Neah Bay High School researched college related behaviors. Older students now model the expected behavior for the younger students and let them know if they are not *measuring up*.
- 6th graders are monitored for good grades, good attendance, and self-regulatory behavior.
- Athletes also succeed at NBHS. Fifty-four percent of the 2011 state championship 1B football team was also on the school honor roll that year.
- Some students have the leadership ability to recruit other students, demonstrating students are an important part of the solution.
- Both schools hold social events and big assemblies to involve community partners and to recognize student achievement and include student voices.
- Teachers and administrators bring successful students back to refresh the cycle, and serve as role models for success.

Post-Presentation Discussion and Feedback

The school seeks STEM professionals from all over to speak to the students. The community is always actively engaged in finding potential speakers. In more than one case, well-known scientists on vacation in the Neah Bay area have been recruited by community members on behalf of the school to speak to classes. The astronaut and NASA scientist, George “Pinky” Nelson, is an example. Marine biologists employed by the Makah Tribe are regular contributors. The school partners with the Department of Fish and Wildlife to run a summer youth fisheries academy as an alternative education program for students who are more interested in hands-on learning. Finally, the school brings in traveling science programs, like the Seattle Children’s Hospital’s Science Adventure Lab, which teaches the vital link between science and health, and inspires tomorrow’s scientists and health care professionals.

A key learning from Dr. Renker’s presentation is that a college readiness filter can be the focal point of engaging students in their educational success. Involving students’ extended families, the community, older students and external resources help cement students’ interest and commitment to being college-ready.

3.1.4 Thomas Romero

Thomas Romero explained that his job involves working in programs that serve at-risk students. Officially, he is known as Director of the Migrant Education Regional Office (MERO) at the Educational Service District 105, in Yakima. Within ESD 105, at-risk migrant students are known as “priority for service kids.”

Biography

Thomas Romero completed graduate work in the Ph.D. program, *Curriculum and Instruction: Culture, Language and Literacy*, at the University of Washington. Earlier, he earned two Master’s degrees in Education plus his bachelor’s degree at Heritage University, and a BA in Music Ministry/Music Education from Bethany University in California. Romero has served as principal, assistant principal and Migrant/Bilingual/Title III Director in the Wapato School District.

Romero told the workshop participants about his childhood, growing up as a second language learner with an older sibling. He described himself as very inquisitive and often an ‘off task’ student. Over time, Romero learned to “play by the rules and to be incognito in the classroom in order to survive.” His language proficiency increased and his test scores improved. In middle school, a school initiated intervention tried to direct him to x-ray technology for a future career, but he wanted to be a physician. Romero understands what it is like for high-risk students to be at a crossroads and his passion is to help them make the necessary gains for success.

Data

For migrant students, the state data dashboard reveals the largest achievement gap is in science. The test scores for 5^{th} and 8^{th} grade students with limited English proficiency (LEP) are “terrible”, according to Romero.

Year	Assessment	LEP Pass Rate
2004-2005	Science WASL	3.6%
2011-2012	MSP	19.4%

The 2004-2005 pass rate for ‘All’ Washington 5^{th} graders was almost ten times the pass rate for students with limited English proficiency.

Year	Assessment	All Students Pass Rate
2004-2005	Science WASL	35%
2011-2012	MSP	66%

In order to improve student learning and engagement in science, Romero offered the following strategies for consideration:

> *Kids can make transitions if they know you care and will support them.*
> *– Thomas Romero*

Strategies for working with ELL students

- Get students back to being natural learners.
- Increase student's interdisciplinary connections by increasing comprehension.
- Learning is social; leverage group and interactive work.
- Students want their teachers to know they are not stupid. "So, don't limit students by their linguistic factors."
- Make language changes in order to empower students: e.g. Instead of "Do the best you can" say: "How can I help you show me what you know about this content?"
- "We can't teach what we don't know." (Quoting Malcolm X.)

Research

Romero also discussed the broad range of research that shows a three pronged approach to engaging students in meaningful learning. Five of the major philosophers involved in learning theory offer similar approaches to integrating intellectual, physical and emotional factors to deepen students' engagement in their learning.

Romero shared this matrix he created to provide a representation of how multiple research findings support an integrated approach to education. The matrix indicates how educators can use other research to integrate the head, hand and heart approach advocated by Thomas Sergiovanni in his book *Moral Leadership: Getting to the Heart of School Improvement* (1996).

		Bloom	*Annenberg*	*Cummins/Krashen*	*Dagget*
Sergiovanni		**Cognitive Domain**	**Academic Press**	**Comprehension**	**Rigor**
		**Psychomotor Domain**	**Social Support**	**Production**	**Relevance**
		**Affective Domain**	**Relational Trust**	**Engagement**	**Relationship**

Connecting the head, hand and heart is crucial in successfully supporting our teachers and students in the articulation of the standards: CCSS, ELD, and NGSS. We need to make these connections intentionally and explicitly. – Thomas Romero

Post-Presentation Discussion and Feedback
When asked how to educate our administrators on the NGSS, Romero suggested, “We need to offer support to principals and our superintendents, as they weren’t trained this way.

A key learning from Romero’s presentation is that kids are natural learners. We should not impose barriers to their natural inquisitiveness by failing to provide opportunities for all students to demonstrate their learning. Language barriers should not be a limitation.

3.2 Strategies Identified by Workshop Participants

3.2.1 Economically Disadvantaged Students

Two teams chose to focus on economically disadvantaged students. The student profile they described was a female from a rural area of Washington. In 2012, 45.5% of Washington students qualified for free and reduced lunch, which is commonly used as a proxy for poverty. Data from the 2011-2012 school year assessments illustrates a gap in test scores: **46%** of low-income students passed the End of Course (EOC) Biology exam, while **71.3%** of the non-low-income students passed the EOC assessment in Biology.

Economically disadvantaged students may be rural, suburban or urban. It is important to remember they are not homogenous. Students might be gifted and talented and/or in alternative education programs. The advantage of the NGSS is that they are intentionally extended to all students. Research highlights that “with equitable learning opportunities, all students are capable of engaging in scientific practices and meaning-making in both science classrooms and informal settings” (NGSS Appendix D page 1).

Two teams chose to use the following NGSS Disciplinary Core Ideas as examples:
- Grade 6-8 Middle School Life Science: Ecosystems Interactions, Energy and Dynamics; and
- High School: Engineering, Technology and Applications of Science.

The teams incorporated strategies pulled from their research and practical experience to use with economically disadvantaged students.

The strategies identified in the next section are not intended to be exhaustive or to show all types of instruction and pre-thinking about these two disciplinary core ideas, but to provide a sample of potential strategies to implement the standards in a bias-free manner.

Effective Classroom Strategies
- Connect science education to students’ sense of place in physical, historical and sociocultural dimensions. For example, students could research the impact of engineering design on their local environment.

- Identify an opportunity to solve a problem in their community, for example a loss of biodiversity or habitat.
- Identify community health or environmental problems to engage girls.
    - Identify a health related engineering problem and solve it;
    - Design a new health plan to address a community health issue.
- Access students' prior knowledge by identifying and applying students' funds of knowledge and cultural practices, e.g. what do they already know about engineering practice and design in their community?
- Use Project Based Learning (PBL). Using PBL techniques (instead of paper-based, teacher directed learning) is effective for science.
- Use *Education for Sustainability* (EfS). Education for Sustainability is an approach to teaching and learning that addresses interconnectedness. It focuses particularly on the interdependence of ecological, social, and economic systems.[1]
- Include high school and post high school planning to decrease barriers and increase intention to continue in science by reviewing prerequisite classes, informal education, and other factors. Students could be asked to review different levels of post-secondary education requirements for careers such as bio-engineering, and the salaries that are anticipated with each career.
- Offer students multiple ways to demonstrate knowledge, e.g. internally at school and externally to their families and the wider community.
- Contextualize their learning as part of a larger central question, which could be extended over several years' coursework.

Home and Community Connections to School Science

- Seek explicit historical connections to a science-related issue within the community.
- Invite mentors and speakers found either in the local community or remotely such as city engineers and utility planners. Using local expertise will help build community networks to access each year and emphasize where these jobs are located.
- Provide reliable Internet connections and access to communication tools like Skype and other sites of interest in order to use a distant professional as a resource in the classroom.
- Involve other community partners who can assist with transportation to various places (student visits to college campuses, worksites, and mentors).
- Create opportunities for older students to mentor younger ones to create informal leadership situations.
- Introduce female students to STEM professionals as mentors and guides who can serve as role models for young women.

School Resources for Science Instruction

Material Resources

- Use text or media resources that reflect, highlight and demonstrate the success of females from similar economically disadvantaged backgrounds.

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[1] Nolet, V., Wheeler, G., Education for Sustainability in Washington State: A Whole Systems Approach, *Journal of Sustainability Education*, May 9th 2010, retrieved from http://www.journalofsustainabilityeducation.org/.

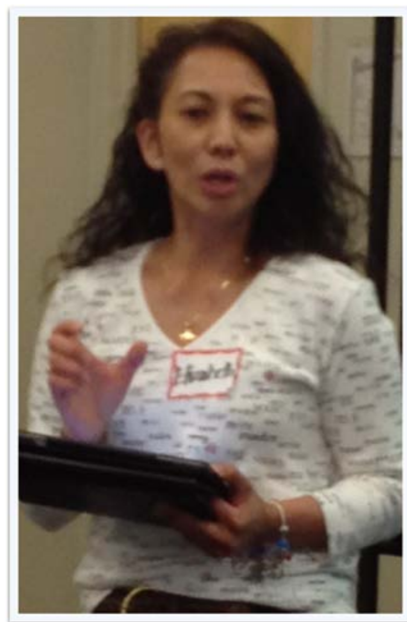
Human Capital

- Offer high quality professional development which includes:
    - Familiarizing all staff with Project Based Learning techniques and goals.
    - Educating all school staff about underlying belief systems and how best to use language when we speak about students.
    - Using ‘people first’ language, e.g. instead of “These students can’t learn”, say “We haven’t taught them this yet”.
- Support a facilitator role for teachers instead of imparters of knowledge.

Social Capital

- Modify school policies as needed to allow unblocked open wireless/broadband connections to various sites and communications tools.
- Speak with *student ability to learn* in mind (all staff).

3.2.2 Students from Major Racial and Ethnic Groups



Two teams developed scenarios that explored how science learning around one of the Disciplinary Core Ideas could be experienced by students from major racial and ethnic groups. The first team created a scenario about African immigrant students with limited English proficiency enrolled in a middle school physical science class. The second team identified a student population that matches the average demographic profile of the state, enrolled in a suburban high school earth and space science course, and learning about earth’s place in the universe.

The first team described their student population as follows:

> *Sometimes within Black student populations there are immigrant students who are incorrectly identified as African Americans. Their home languages are not often well-described and understood in school communities. There are often fewer resources for translation and student support. There may be little readily available information about the cultural diversity within their communities. Some of the students in this immigrant population have little or no prior school experience. There may be generational trauma issues that impact learning and participation in schools.*

The second team described their student population as mirroring the state demographic profile:

> *These students attend AHS (Average High School). Amazingly, the demographics of this school reflect the state averages (as far as demographics are concerned – Asian and Pacific Islander 7.1%, American Indian 1.6%, Black 4.6%, Hispanic 20%, White 60%) with 46% of the students’ families at or below the federal poverty level. The school is suburban, and while their test scores are exactly average, they’ve noticed their Black and Latino students’ scores are reflective of the state achievement gap as well. The school hopes to change this.*

Using these scenarios each team identified effective classroom strategies that would provide learning support for each of the student populations described. Note that most of these strategies can be generalized across all scientific disciplines. In some instances, the teams identified strategies specific to the Disciplinary Core Idea selected in their scenario descriptions. Strategies from both teams are integrated in these sections.

Effective Classroom Strategies

- Collaborate with colleagues around the selected standard(s).
    - Work on a math exercise using the *Powers of 10* video and resources to understand the crosscutting concept of scale. See http://www.powersof10.com/.
    - Consider connecting with English language arts teachers around science fiction reading/writing when teaching about earth and space science.
    - Network with other educators to explore home and community connections and school resources related to the selected disciplinary core ideas.
- Establish context from students' prior knowledge.
    - Consider the foundational knowledge that students will need in order to meet a particular standard.
    - Assess students' prior knowledge of the words students use about individual elements of the standard. In the case of a middle school lesson on waves, discuss lights, sound, wavelength, frequency, amplitude, etc.
    - Assess students' prior knowledge of the mathematics used within the standard. For example, students may be using a traditional counting system. Quantitative competency may need attention to establish full understanding.
    - Look for deeply held cultural beliefs about where light or sound comes from. Try to match this in an outcome-based plan considering what students should know when meeting the standard.
    - Have students collect stories from their families about their culture's view of how the universe was created. Additionally, the teacher could introduce several cultural views regarding the creation of the universe.
- Use multiple modes of representation and experience.
    - Use multiple representations of models with all students. For example, perform hands-on work with digitized and non-digitized signals for quality and clarity of signals to better understand wave functions.
    - Utilize technology where possible. For example, there are simple, free software applications that show the wavelength, frequency and amplitude of your voice. This gives students a better perspective of sound waves compared with traditional wave tank models, where students will often ask, "What does this wave tank have to do with sound coming to my ear?"

    - Rather than having students simply write their responses, provide multiple opportunities to record/report their thinking. For example, students could use multiple media and presentation formats to communicate ideas to a variety of audiences.
    - Use multiple resources to present scientific phenomena – including print, video, and other cultural images.
- Engage in culturally relevant teaching and learning models.
    - Encourage student-to-student work. Pair students who have English proficiency, with students who do not, to record the group results.
    - Use small student groups with a cooperative group strategy including norms and structures that support student discourse. Establish a small group culture in the classroom that includes a positive behavioral system. Build community by identifying specific instances within the groups that show how each student contributes something to the group.
    - Provide students with science examples that are carefully selected to describe the phenomenon without discounting cultural beliefs..

Home and Community Connections to School Science

- Find and utilize cultural and community connections to the selected standard.
    - Sound is ephemeral. Use community connections to locate ethnic instruments and discuss how they transmit sound waves.
    - Find additional cultural connections to sound. Yodeling, East African Nilotic cattle calling patterns, etc.
- Identify and connect with community members and resources.
    - Send students into the community to look for how sound or light is used and its importance to the community. This could include communication, singing, or religious practices.
    - Lead a Community Walk (e.g. go out in the community and look for connections). Have students do this in relation to sound and light waves.
    - Have students interview community members asking how they use sound.
- Connect teaching and learning to parents and family.
    - Offer Family Science Nights where students present their own work at the end of Project Based Learning units.
    - Create assignments where students connect with their parents. Such assignments foster dialog, increase interest among parents and students, and can solicit home language support for science learning.
    - Create opportunities for high school students to lead learning with younger students and siblings.

School Resources for Science Instruction

Material Resources (curricular materials, equipment, supplies, and expenditures)

- Build existing science units focused on sound.
- Provide access to technology resources – including smart phones and WiFi to provide real world contexts.
- Utilize Washington state resources, including LIGO[2] and other astronomical observatories, The Museum of Flight, astronomy clubs, United States Geologic Survey (USGS), oceanography departments at universities.
- Use additional real-world examples, such as metal detectors, seismographs (USGS), DirectTV or cable TV.
- Engage students with films and television series that address science concepts through a diversity lens or with characters or narrators from diverse backgrounds, for example, the television series *Through the Wormhole* narrated by Morgan Freeman. See http://science.discovery.com/tv-shows/through-the-wormhole.

Human and Social Capital (knowledge collaboration and leadership, relationships among individuals in a group, including norms like trust, collaboration, common values, shared responsibility)

- Establish a culture of support for teachers to access additional human capital outside of the school environment in an effort to provide opportunities for children to engage in field experiences such as learning about the 'depth sounders' at Sandpoint Naval Station at Magnuson Park in Seattle.
- Identify and address real-world situations involving sound. For example, how do the Seahawks know that the Seahawks fans are the loudest fans in the NFL? Explore how the ear works, earbuds, ear protection, and how sound waves can impact hearing. Have students test different headphones to determine which would protect the ear the most. Have students test claims made by companies producing sound eliminating headphones.
- Consult with the school audiologist for resources that would be interesting and engaging for students learning about sound. Consider inviting the Lions Club or other local charitable organizations to test student hearing.
- Collaborate with and across departments when doing applied science.
- Identify science mentors for students to allow them to explore career connections.

3.2.3 Students with Disabilities

One team developed a student profile and strategies for NGSS implementation with students with disabilities. The category 'Students with Disabilities' might include students with specific learning disabilities, students with a speech or language impairment, or students with an intellectual disability, an emotional disturbance or other heath impairment.

[2] Laser Interferometer Gravitational-Wave Observatory located at the DOE Hanford Site near Richland.

Approximately 13% of the US student population receives special education services under the Individuals with Disabilities Education Act (IDEA).

Middle school physical science provides the backdrop for the following scenario which focuses on students with disabilities. The team developing this scenario identified the following characteristics:

Our target student population is male middle-schoolers, age 11-14. Often, students with disabilities are pulled out of science lessons in elementary school to work on other essential academic skills. Each student has an Individualized Education Plan (IEP) that outlines strategies for supporting the student. For example, one student in our scenario has general processing deficits with memory difficulties. The student is accessing academic curriculum at a lower elementary level and his social skills development is behind that of his peer-age group.

Effective Classroom Strategies

- Ensure the student feels safe and able to engage in discourse – placing the student 'as part of the group' is not enough. Define what *inclusivity* is based upon the situation. Model expected behavior for all students.
- Be attentive to classroom culture – model collaboration as a vehicle for inclusivity. Group work is essential.
- Use language support strategies to facilitate discourse. Do not let reading or writing be a barrier to participation.
- Teach children, not concepts. Partner with the student's special education teacher to learn effective individualized teaching and learning strategies for the student.
- Create high touch, multi-sensory learning experiences. Use models wherever possible – multiple representations of the same strategies are particularly effective. Include sensory experiences (sounds, touch, smell, etc.).
- Develop multiple or modified avenues for gathering scientific evidence.
    - Provide opportunities for students to use direct experience and their senses to gather data and engage a variety of learning styles. For example, consider a class studying water quality. They leave the classroom to examine a small nearby stream. They begin with the question: Is the stream healthy enough to support life? A wide variety of data is gathered to answer this question. Some students use probes to measure temperature, conductivity and pH. Some students hold the probes, others record data, others focus on ensuring quality control of the process. Other students work in teams to look for evidence of life near and in the stream. Some of the students use field guides to identify the life they find, other students describe, or draw images of

the life that they find. Some of the student groups compile the data into conclusions, stories, or art work that represents an answer to the question.

- Utilize quick learning rewards and positive feedback. “We figured something out! Now let’s take what we learned and ...”
- Reinforce concepts by giving the students an opportunity to share the lessons they have learned in multiple ways.
- Leverage communications technology (e.g. speech/text tools, input charts, subject-specific dialog/concept cards etc.) so that the student is better able to share contributions with others.

Home and Community Connections to School Science

- Send students home with kits and materials to explore scientific concepts with their families.
- Make sure that the students’ parents know that their children are being taught science. Engage parents in supporting science instruction for the students. Have parents reinforce the sense that their student is a scientist.
- Seek support from the student’s family to help the student learn generalized academic skills like the ability to focus on a concept for longer periods of time.
- Connect families to their local informal science communities and science resources.

School Resources for Science Instruction

Material Resources

- Seek out instructional materials that provide support for students with disabilities.
- Provide tools and resources to facilitate communication, reading and writing.

Human Capital

- Collaborate with the student’s special education service provider specialist.
- Identify the specialists in the school that can support creative strategies for engaging the student.
- Design targeted collaboration training with science and special education teachers.

Social Capital

- Make sure that there is a science philosophy that extends beyond the science classroom.
- Cultivate scientific literacy as an important dimension of success for all students.
- Be intentional across all the grades to make sure that science is part of the student’s whole school experience.
- Set the tone at the top that all students, including students with disabilities, can and should learn science. Administrator support is critical.

3.2.4 Students with Limited English Proficiency

Two teams addressed effective strategies for teaching science to students with limited English proficiency (LEP). The first team outlined a scenario that focused on teaching high school students a physical science lesson about computational models for energy flows in systems. The second team set up a scenario for 4th grade Latino students, learning about reducing the impacts of natural earth processes on humans.

In the high school physical science scenario, the student characteristics are described as:

> *This student is a newcomer with very low English language skills, but a wealth of academic background knowledge. This student has been enrolled in an academically challenging program in their home country. Parents are career oriented. Parents may be political refugees or professionals.*

The 4th grade group focused on students from Latino families where the dominant language for parents is Spanish, but where the siblings are moving towards English as the dominant language:

> *In our group, there are some students where English is now their dominant language, but their overall English Language Proficiency Level is 2. Code switching is common. Their reading and writing level is most closely matched to the 1st grade level. Some of the students have minor learning disabilities.*
>
> *This mixed group of boys and girls are all economically disadvantaged. The dominant language for the parents is Spanish, but not for the siblings. Many of the siblings are moving towards English as the dominant language, but use code switching in their sentence constructions. The parents are most fluent in Spanish and literate in English only at the third grade level. Families do have computers in their homes, but do not know how to access information on the Internet. Most parents own cell phones and respond to text messaging and voice messaging.*

Effective Classroom Strategies

- Employ proven literacy strategies, including:

    - Sheltered Instruction Observational Protocol (SIOP) to promote academic discourse. SIOP is a teaching style founded on the concept of providing meaningful instruction in the content areas for transitioning LEP students toward higher academic achievement while they reach English fluency. See www.SIOPinstitute.net.
    - Guided Language Acquisition Design (GLAD), a professional development and instructional model that provides effective strategies for promoting English language acquisition, academic achievement, and cross-cultural skills. See www.projectGLAD.com.
    - English Language Development Standards (ELDS) to create next steps. See www.k12.wa.us/migrantbilingual/eld.aspx.
- Use language support strategies with English language learners.
    - Employ oral/written language frames for student responses.
    - Use input charts with pictures for group brainstorming, graphic organizers and translated materials when available.
    - Use labels to help improve English proficiency.
    - Utilize students with higher English proficiency to help less language proficient students engage in sense-making activities.
    - Emphasize group work and paired learning activities where all students are accountable for group knowledge.
    - Use sentence patterning charts with sentence strips to write out a beginning, middle, and end to a problem and solution.
- Employ discourse strategies liberally to ensure all students can demonstrate knowledge.
    - Use discussion cards, for example, E.L. Achieve at www.elachieve.org.
    - Accept interactions in multiple languages, building on concepts in both languages.
    - Allow students to demonstrate mastery of concepts, based on their strengths (e.g. hands on demonstration versus writing, speaking versus writing sample; graph, chart or video versus demonstration in front of the class).
- Provide home language support.
    - Ensure access to technology that can translate words (for example: dictionaries, Google translate).
    - Emphasize cognates in concept development (ex: http://spanishcognates.org).
    - Use peer groups for negotiation of meaning.
    - Use language support strategies and home language support for assessments.
    - Identify core vocabulary in multiple languages.
    - Identify how math symbols are similar or dissimilar.
- Utilize hand-on science exploration whenever possible to build concepts. For example, build project of mini-structure on a table top out of sticks, mud and straw, blocks, etc. and shake to observe the effects; or use a computer program to show how a back-fire fights fires.

- Localize the concept being discussed. For example, in studying natural disasters, identify hazards that are local to their region and relate them to contemporary times (e.g., hail storms on orchards, forest fires affecting forestry and fishery, floods affecting infrastructures and neighborhoods.
- Use a variety of research-based resources to build group engagement, such as Gardner's *Eight Intelligences Frames of Mind: The Theory of Multiple Intelligences*, by Howard Gardner, 1983, 2011. www.howardgardner.com.

Home and Community Connections to School Science

- Use instructional assistants and other members of communities to ask students what they already know about a subject in their home language.
- Involve parents in science learning.
  - Ask parents how they would like to communicate and inquire about their use of technology (texting, phone, email, etc.).
  - Invite parents into the classroom or to participate in field trips.
  - Invite and include family and extended families to events.
  - Interview parents about their experience related to the scientific concept, for example, have students interview their parents about a natural disaster plan for their family.
  - Schedule meetings, being sensitive to family needs, such as work hours, outside activities.
  - Bring families together to learn scientific vocabulary and discuss cultural relationships.

School Resources for Science Instruction

Material Resources

- Provide books at appropriate reading levels that describe the scientific concepts.
- Use video, including bilingual videos if possible, to expose students to science.
- Allow students to search the web and have students view information related to the topic.
- Make use of science blocks to ensure adequate time to present complex topics.
- Promote and make accessible support materials from the district or Educational Service District (ESD).

Human Capital

- Provide professional development opportunities on SIOP/ GLAD / ELDs / CCSS/ NGSS.
- Use professional learning communities for teachers with similar students to provide opportunities to collaborate with other peers.
- Provide prep time and resources to create materials to support students.

- Offer cultural education including familiarizing teachers with cultural norms and expectations.

Social Capital

- Explicitly create a culture where at-risk students are well supported.
- Bring in guest speakers that represent the cultures in your community.
- Engage collaboratively with all stakeholders (ESL/ELL teachers, content teachers, administrators, and community members) to support English language learners.
- Set high expectations for all students.
- Establish classroom norms that encourage collaboration and democratic practices.

4 Conclusion

Why is this work significant?

A fundamental vision of the NGSS is to make all of the science standards accessible to all students. First, it is imperative to reach out to all students in an equitable manner and engage their interest in learning science. Second, a few well-placed simple steps can make all the difference in the world for reducing the achievement gap in science. Third, the NGSS represents a new opportunity to make science relevant, interesting and meaningful for all students, their families and the broader community, if implemented correctly. Implementing the NGSS in a bias-free and culturally sensitive manner will help reduce the achievement gap and increase interest in science, technology, engineering and math-related careers.

NGSS will give us a chance to do it right this time.

– Thomas Romero

How can this work be extended or adapted?

OSPI encourages districts to engage in conversations around a bias-free and culturally sensitive implementation of the NGSS to ensure equitable access to science by all students. Districts can use this report and the assessment tool in Appendix A of this report as a roadmap to have important conversations about how to implement the NGSS with their particular student populations. Local experts, educators, and community members can participate in dialog about the most effective strategies to engage local students in learning science. The real value is in the process of coming together, discussing ideas for implementing the strategies, and learning from each other.

Appendix A. NGSS and Equity Assessment Tool

NGSS and Equity ("All Standards All Students") Assessment

Directions: Choose a standard. Identify a diverse (non-dominant) student group (reference: NGSS Appendix D page 12-13). Analyze the standard in terms of meeting the needs of a non-dominant group.

Group Members: ______________________________

Grade, DCI, and Topic:
(e.g., K-PS2 Motion and Stability: Forces and Interactions) ______________________________

Select & circle a primary accountability group below. Then select zero, one or more additional student diversity characteristics in that row.		**Additional Student Diversity Characteristics**						
		Gender	**Students in alternative education programs**	**Gifted and talented students**	**Economically disadvantaged students**	**Students from major racial and ethnic groups**	**Students with disabilities**	**Students with limited English proficiency**
Primary NCLB Accountability Group	**Economically disadvantaged students**							
	Students from major racial and ethnic groups							
	Students with disabilities							
	Students with limited English proficiency							

Describe the student group characteristics this case study is addressing:

How could the standard be taught in a way that addresses the needs of students from diverse backgrounds (non-dominant group)?

Effective Classroom Strategies (ref: NGSS Appendix D page 7-8):

Home and Community Connections to School Science (parent involvement, community context, informal environments) (ref: NGSS Appendix D page 8-10):

School Resources for Science Instruction (material resources, human capital, and social capital) (ref: NGSS Appendix D page 10-12):

Appendix B. Acknowledgements

We are indebted to the volunteers who thoughtfully assisted in conducting the Science Standards Bias and Sensitivity Review Process. Participants worked very hard to identify successful strategies to reach all students and engage their interest in the sciences. They devoted many hours out of their busy schedules to do this work. We are grateful for their efforts.

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