



Student Achievement Committee

June 18, 2013

**Presentation/Discussion on Next
Generation Science Standards**
Preparing Hawaii's Students for College, Career,
and Community

The Urgency for Next Generation Science Standards

- In 2007, a Carnegie Corporation of New York/Institute for Advanced Study commission of researchers and public and private leaders concluded that:
“The nation’s capacity to innovate for economic growth and the ability of American workers to thrive in the modern workforce depend on a broad foundation of math and science learning...”
- Science and mathematics achievement continues to lag compared to our international competitors, and has impacted the competitiveness of the U.S. in the global economy.
 - **U.S. ranked 17th in science and 25th in mathematics as compared to students from 34 other countries on the 2009 PISA Assessment.**
 - **U.S. global high tech exports dropped from 19% to 15% in 2010.**
 - **China’s global high tech exports tripled from 6% in 1995 to 22% in 2010.**
 - **Increase demand for STEM workforce.**

Sources:

http://usatoday30.usatoday.com/news/education/2010-12-07-us-students-international-ranking_N.htm

<http://www.nsf.gov/statistics/seind10/co/cos11.htm>

STEM Workforce Statistics

- In 2010, 7.6 million people or 5.5% of the labor force worked in STEM occupations.
- Over the past 10 years, growth in STEM jobs was three times greater than that of non-STEM jobs.
- STEM occupations are projected to grow by 17% from 2008-2018, compared to 9.8% growth for non-STEM occupations.
- STEM workers command higher wages, earning 26% more than their non-STEM counterparts.
- More than 2/3 of STEM workers have at least a college degree, compared to less than 1/3 of non-STEM workers.

Source: U.S. Department of Commerce, Economics and Statistics Administration, ESA Issue Brief #03-11 July 2011

Next Generation Science Standards (NGSS) Connection to STEM

- The engineering aspects of the Next Generation Science Standards will clarify for students the relevance of science, technology, engineering and mathematics (STEM) to everyday life.
- The organizational schema of NGSS enables students to interrelate knowledge from various science fields into a coherent and scientifically-based view of the world.
- NGSS relates scientific or technological knowledge to the interests and life experiences of students; opening doors to the possibility of college and career choices in STEM.

What's Different About the Next Generation Science Standards

- Reflects the interconnected nature of science through hands-on experiences to address real world community problems (sustainability, energy, food production).
- Stated as demonstrated student performance expectations versus content knowledge benchmarks.
- Focuses on increased lab time to support preparation of students for the next generation workforce.
- Integrates Common Core State Standards for English/Language Arts and Mathematics.

Sample Page of the NGSS

4-PS3 Energy	4-PS3 Energy	4-PS3 Energy
<p>4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measurements of changes in the speed of an object or an equation or quantitative definition of energy.]</p> <p>4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. [Assessment Boundary: Assessment does not include quantitative measurements of energy.]</p> <p>4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]</p> <p>4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound, and a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be tested in those that convert energy to electric energy or use stored energy to cause motion or produce heat or light.]</p>	<p>4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measurements of changes in the speed of an object or an equation or quantitative definition of energy.]</p> <p>4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. [Assessment Boundary: Assessment does not include quantitative measurements of energy.]</p> <p>4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]</p> <p>4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound, and a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be tested in those that convert energy to electric energy or use stored energy to cause motion or produce heat or light.]</p>	<p>4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measurements of changes in the speed of an object or an equation or quantitative definition of energy.]</p> <p>4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. [Assessment Boundary: Assessment does not include quantitative measurements of energy.]</p> <p>4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]</p> <p>4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound, and a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be tested in those that convert energy to electric energy or use stored energy to cause motion or produce heat or light.]</p>
<p>4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measurements of changes in the speed of an object or an equation or quantitative definition of energy.]</p> <p>4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. [Assessment Boundary: Assessment does not include quantitative measurements of energy.]</p> <p>4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]</p> <p>4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound, and a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be tested in those that convert energy to electric energy or use stored energy to cause motion or produce heat or light.]</p>	<p>4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measurements of changes in the speed of an object or an equation or quantitative definition of energy.]</p> <p>4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. [Assessment Boundary: Assessment does not include quantitative measurements of energy.]</p> <p>4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]</p> <p>4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound, and a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be tested in those that convert energy to electric energy or use stored energy to cause motion or produce heat or light.]</p>	<p>4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measurements of changes in the speed of an object or an equation or quantitative definition of energy.]</p> <p>4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. [Assessment Boundary: Assessment does not include quantitative measurements of energy.]</p> <p>4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]</p> <p>4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound, and a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be tested in those that convert energy to electric energy or use stored energy to cause motion or produce heat or light.]</p>

Energy and Energy Transfer



- 4-PS3-2: Make observations and provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- 4-PS3-4: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.



Support to the State's Strategic Plan

- ☞ **Strategic Plan Goals 1: Student Success**
 - Objective: All students are engaged and ready to learn
 - 1A-I: Incorporate an interdisciplinary curriculum
 - Objective 1B: All students are gaining the academic skills they need to succeed on the K-12 pathway and throughout their lives.
- ☞ **Emphasizes 21st Century Skills:**
 - Critical thinking and problem solving
 - Communication
 - Collaboration
 - Creativity and innovation
- ☞ **Rigorous and relevant learning**

Next Steps

- ❏ **HIDOE will join the NGSS National Network. Network will provide assistance in:**
 - Planning and implementation of NGSS.
 - Science curriculum and assessment of NGSS.
 - Professional development activities for in-service and pre-service teachers.
- ❏ **HIDOE will continue to participate in the Council for State Science Supervisors' (CSSS) Building Capacity for State Science Education Initiative.**
- ❏ **Science Education will develop and implement a NGSS adoption process.**
 - Public feedback to adopt NGSS.
 - A crosswalk document to compare HCPS III with NGSS.
 - Discussion of curricular, assessment and instructional impacts for all students, including special education, English language Learners, Gifted and Talented.
 - A plan for dissemination and implementation of NGSS, including support to teachers and school community.
- ❏ **Approval and adoption of NGSS by the BOE.**
- ❏ **Dissemination of NGSS to all stake holders – administrators, teachers, parents, institution of higher education, professional educational organization, unions.**
- ❏ **Professional development opportunities to support all stakeholders.**