SDUHSD Science Newsletter
January 2019
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Cindi and Jenn will be using these updates as a communication tool each month. The newsletter archive is hosted here. Please e-mail jennifer.mccluan@sduhsd.net should you notice any colleagues not receiving it.

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Professional Development 2018-2019

January Inservice Debrief

It was great seeing everyone at our January Inservice. Thank you for completing the Post-PD survey. Jenn has summarized the results here:

Key Takeaways: What Science Teachers Found Valuable (GOTS)

- Teachers appreciated the opportunity to experience a course-specific lesson as "students" with their peers.
- They also appreciated the chance to debrief these lessons through multiple lenses.
- Teachers valued the sample assessments shared, and the assessment debrief session and tools, particularly the NGSS-developed Prescreen Red Flag Checklist.
- Teachers found the collaboration time with peers to be extremely valuable, particularly the chance to apply their learning with others to lesson and assessment development.

Key Takeaways: What Science Teachers Are Asking For (NEEDS)

- It should come as no surprise that many teachers are asking for more time to collaborate, both in district PD settings and at their school sites in course-alike teams. They would like to use this time to develop lessons and assessments.
- They would like to see more examples of assessment and engage in collaborative assessment analysis.
- Teachers indicated an interest in a session devoted to interactive notebooking, which Tracy McCabe has kindly offered to plan and lead. Jenn will follow up with Cindi and Bryan to see how we can best meet this request.
- Teachers highlighted the importance of quality instructional materials, and the desire to move forward in our district process. Ed Services is developing this plan and timeline, and will share at our March PDs.
- For teachers who indicated an interest in attending outside Professional Development (such as HHMI, SDCOE offerings, etc.), I will follow up with them to assist with registration.

Please know this survey feedback will be used in the development of our March PDs, which will also include a focus on instructional materials.

March PDs

Our March PD schedule is as follows (please request your subs using "District Achievement" as the sub funding source if you have not already so):

- March 12, 2019: 7th and 8th Grades
- March 19, 2019: Biology
- March 26, 2019: Chemistry and Physics

All sessions are scheduled from 8:00 am - 2:30 pm at the District Office in the Large Board Room. A detailed agenda will be shared as we get closer, and a discussion of instructional materials and our district will be included.

NGSS Updates and Resources

NGSS Now

This January edition includes a spotlight on a research study conducted that explored the relationship between teaching practice and student learning in teaching students the NGSS. The study found that 4th and 5th grade students whose teachers participated in in an analysis-of-practice professional learning program outperformed students whose teachers participated in a in a content-deepening program. In other words, simply providing professional learning on content is not enough for NGSS implementation and to improve student outcomes; professional learning also needs to focus on teaching practice.

CAST Practice Items Scoring Guide

The scoring guides for the CAST 2018-2019 exams have been released. Thanks to Sally Nguyen for sharing!

UC App for Physics: of the Universe

Our district is in the process of submitting our UC application for Physics: of the Universe. A huge thank you to Bryn Bishop for taking on this project and authoring a fantastic document! Once we receive feedback from the UC system, Cindi and Jenn will share a copy of the application with teachers.

Biozone Chemistry Sample Chapters Released

Biozone has released three sample chapters from their *Chemistry in the Earth System* product (the final product is expected in mid-2019, and a *Physics of the Universe* Product is also being developed. All Biozone products can be found here. It has been designed and written following the High School Three-Course Model for California. It will also suit NGSS-aligned states integrating Earth Science with Chemistry. This phenomena-based title takes a three-dimensional approach to provide an engaging, relevant, and rigorous program of instruction. Departing from the more traditional approach of BIOZONE's Non-Integrated Series, the Integrated Series offers a learning experience based on the 5 Es and anchored in student-relevant phenomena and problems. Andrea Lawless is piloting Biozone for AP Environmental Science this spring, and is sharing updates for those interested. Thanks to Andrea Lawless for sharing!

Interesting Reads and Resources

Cognitive Science Research and NGSS

NGSS is based on several decades of research that examines how students best learn science. Research on how students learn science effectively has been a long-term interest of the National Research Council, which published *How People Learn, How Students Learn, Taking Science to School,* and *Education for Life and Work*. Findings in cognitive science permeate the *Framework for K-12 Science Education* and were central to the development of the Next Generation Science Standards (NGSS). Colleagues who recognize the significant

shifts inherent in NGSS are often curious as to whether or not these shifts are best for student learning, and if they will prepare students for college and career. The resources collected here focus on what research has shown to be effective in student learning of science concepts and practices. Many thanks to Brinn Belyea for his enthusiasm and hard work to gather and share resources to make this site possible.

Principles of Instruction: Research-Based Strategies that All Teachers Should Know
This article from the American Educator shares ten research-based principles of instruction with which all teachers should be familiar. Thanks to Brinn Belyea for sharing!

SimBucket
Similar to PhET, SimBucket contains over 50 free, browser-friendly HTML5 simulations. Thanks to Brinn Belyea for sharing!

Environmental Impact Calculator
This BBC article explores the environmental impacts of food/drink consumption, and includes a calculator that calculates impact of a food/drink item depending on how frequently you consume it. Thanks to Megan Bert for sharing!

HHMI Videos
The Howard Hughes Medical Institute has free DVDs for educators that you can order here. Thanks to Megan Bert for sharing.

Sync Your Calendar with the Solar System
The New York Times has created a space calendar you can synch with your Google and/or iOS calendar so you want miss any major celestial happenings (including space launches).

Middle School Science

Possible Worlds
This site houses interactive lessons and learning games. The Possible Worlds digital games are designed to help improve student understanding of phenomena that are often the subject of scientific misconceptions. Developed by EDC|Center for Children and Technology (EDC|CCT) over the course of two research and development projects, the games are the centerpieces of modules that address four topics: photosynthesis, heredity, electricity, and heat transfer. Each module includes accompanying classroom activities that leverage students' experiences within the games.

Teach Engineering
This is a great resource for teachers looking to incorporate more engineering into their classrooms. Thanks to Megan Bert for sharing!

HHMI Lizard Evolution Virtual Lab
This virtual lab includes four modules that investigate different concepts in evolutionary biology, including adaptation, convergent evolution, phylogenetic analysis, reproductive isolation, and speciation. Each module involves data collection, calculations, analysis and answering questions. The "Educators" tab includes lists of key concepts and learning objectives and detailed suggestions for incorporating the lab in your instruction. Thanks to Megan Bert for contributing!

Content-Specific Articles for 7th and 8th Grade Integrated Science

Looking to have your students engage in more scientific reading related to your course content? CVMS science teacher Megan Bert has created this compilation on her class website. Thanks, Megan!

Planetary Collision that Created Moon Also Made Life on Earth Possible
In new research published this week, scientists have found strong evidence that the essential elements for life were deposited on Earth after it collided with the proto-planet that carved out the Moon.

High School Science

New York's New Visions Open Education Resource NGSS Curriculum
New York has adopted NGSS and is making their OER (free) curriculum for Biology, Earth-Space Science, Chemistry, and Physics available online for educators from any state. Thanks to Chris Faist for sharing.

Disaster at the Daisys': The Analysis of Forensic Evidence
This directed case study was written to help students understand both organic and inorganic analysis of forensic evidence. It tells the story of a fire at the home of Mr. and Mrs. Daisy who are found deceased on the property, both with gunshot wounds. Students assume the role of forensic investigators as they attempt to determine whether the gunpowder pattern evidence points to homicide or suicide. A series of questions guides students through an investigation of pattern evidence and accelerants so that they can develop a hypothesis about the crime. Students must also determine the instrumental methods of analysis needed for the analysis of evidence. This case study was designed for a forensic science course for non-science majors, but could also be used at the high school level or adapted for an instrumental methods course or an organic chemistry course.

The Cold Never Bothered Me Anyway: Woolly Mammoth Hemoglobin and Extreme Adaptations
Woolly mammoths and other cold-adapted animals, such as reindeer and musk ox, developed a number of adaptations that allowed them to survive in frigid environments. These include small ears, thick fur, and even long tusks. Many of these species developed methods that preserve heat in the core and allow legs and feet to cool in the snow. Researchers, however, realized that cold extremities could pose a problem for the delivery of oxygen to the cells of those limbs and began to investigate the differences between the hemoglobin of cold-adapted and warm-adapted mammals. This directed case study examines the difference in hemoglobin structure between humans, Asian elephants, and woolly mammoths to provide insight into one of the important cold adaptations of the woolly mammoth. It was developed for the first semester of a two-semester, upper-level biochemistry sequence and was presented after students had learned the basics of protein structure, allosteric effectors, and human hemoglobin. This case could also be used in a single semester biochemistry course.

A Rainbow of Sepia: The Evolution of Human Skin Color
This flipped case study examines the selective pressures that have affected the evolution of diverse human skin pigmentations. To prepare for the case, students begin by watching videos and doing research on their own. In class, students use the information they have learned to answer questions that follow the research of Penn State anthropologist Nina Jablonski. As students work through the case they alternate between reading sections of the case study handout and viewing short video segments that reinforce concepts and engage students in the story of the real-world protagonist. At the end of the 90 minutes, students realize that several opposing pressures can act on one trait and that evolution can be a balancing act. This case is appropriate for AP and freshmen biology students who are completing a unit on evolution. It is adapted from an earlier case by the same author, "The Evolution of Skin Color."

The Biochemistry of Curly and Straight Hair

This interrupted case study examines basic concepts of chemical bonding by telling the story of “Madison,” who is learning about the texture of her hair and how it can transition between its natural curly state to a smooth, straight texture. The case can be used to teach or review the major categories of bonds (ionic, covalent and hydrogen), major macromolecules of life, and hydrolytic and dehydration reactions. It also explores how chemical relaxers and heat through blow drying and flat-ironing can change the nature of straight, wavy and curly hair through the disruption of protein shape. Students learn what it means when a protein has become denatured and how various variables such as pH, heat and salts can lead to the unraveling of the three-dimensional shape of proteins. This case is suitable for an AP high school course, or for an introductory biology or chemistry course for majors or non-majors; it can also be used as a review of basic biology and chemistry for students in an upper-level biochemistry course.

Importance of Understanding Fundamental Chemical Mechanisms

Excerpt from this Journal of Chemical Education article, “Traditional chemistry curricula organize the presentation of concepts around standard disciplinary topics (e.g., atomic structure, chemical bonding, kinetics) and divisions (e.g., analytical, organic, physical). This approach often makes it difficult for students to identify and meaningfully comprehend underlying assumptions and ways of reasoning that cut across conventional content bins.(8) It also poses a major challenge to any educational reform effort that seeks to help students build connections between chemistry topics and courses, and to integrate ideas within the discipline and across different scientific fields.(9) I claim that such connectivity and integration could be facilitated by more actively, systematically, and explicitly engaging students in the analysis, discussion, application, and reflection of the fundamental chemical mechanisms described in this paper. Such mechanisms are commonly deployed by professionals in different fields to build explanations and support arguments about the properties and behaviors of chemical entities across a wide variety of systems and processes.”

Learning Opportunities (Students)

Google Science Fair

Submissions open in September 2018 for students between the ages of 13-18. Thanks to Cindi Schildhouse for sharing.

Expanding Your Horizons

It’s that time again! Expanding Your Horizons (EYH) is a non-profit annual conference aimed to interest girls, in grades 6th - 10th, in science, math, engineering, and technology (STEM). Over the past decade, the San Diego chapter of EYH has introduced thousands of young girls to exciting STEM careers. Our conference offers hands-on workshops and activities organized by some of San Diego’s best and brightest professionals in STEM industries. To excite and prepare students for college life, it is hosted at the University of San Diego (USD). Our ultimate goal is to motivate girls to become innovative and creative thinkers ready to meet 21st century challenges. Parents are also encouraged to attend their own workshops that focus on college applications, financial aid, etc. Student registration is now open! Please visit: www.EYHSanDiego.org Fee waivers are available for those who request them during the application process. Flyers are available for download on our website as well. This year’s conference is on Saturday, March 23, 2019, hosted at the University of San Diego.

COSMOS at UCSD

COSMOS is recruiting students for the upcoming 2019 Summer! Please pass along this information to your talented students who are passionate about STEM related fields. Applications will be online January 4th - February 1, 2019 and require two letters of recommendation from teachers, preferably in the STEM fields. Please contact cosmos@ucsd.edu if you would like to receive our informational powerpoint, links to COSMOS videos, or with any questions regarding the application or selection process. Thanks to Brinn Belyea for sharing!

NASA’s JPL MEchanical Maker Challenge: Mechanical Eye

With its sulfuric acid clouds, temperatures over 450°C, and 92 times the surface pressure of Earth, Venus is one of the most hostile planetary environments in the solar system. Prior missions have only survived hours! But an automaton (or clockwork mechanical robot) could solve this problem. By utilizing high-temperature alloys, the clockwork rover would survive for months, allowing it to collect and return valuable long-term science data from the surface of Venus. Learn more about the automaton rover, here.

At NASA's Jet Propulsion Laboratory, we are turning this innovative concept into reality under a NASA Innovative Advanced Concepts funded study. We've been working hard on this project, but we could use YOUR help to address some of our toughest mechanical design challenges! The Mechanical Maker Challenges are a series of challenges seeking to engage your creativity to invent mechanical ways of performing traditionally electrical tasks. Challenges will be released in series, one at a time.

First up: Create a clockwork mechanical camera for Venus. Are you up for the challenge? **Submit your entry by Jan. 30, 2019!**

Visit Challenge.gov to learn more and participate. Stay tuned for details on the next challenges in the series, to be announced on March 1 and July 1, 2019.

Spellman Clean Tech Competition
This year's "Spellman Clean Tech" challenge is to identify an issue in one of two categories: Mitigating the Effects of Climate Change, and Resource Preservation. You will need to research, test, and retest your hypothesis to find the most efficient solution. Your team will explain in detail the specifics of your creation, and the top teams will be asked to create a prototype to present at our finals competition in July 2019. Visit https://www.cstl.org/cleantech/ for registration information and deadlines. Thanks to Brinn Belyea for sharing.

MIT Minority Introduction to Engineering and Science
The MIT MITES Program (now part of the MIT Office of Engineering Outreach Programs, OEOP), reporting to the Engineering Dean, has continued to grow. The MIT Minority Introduction to Engineering and Science (MITES) Program is a rigorous six-week residential science and engineering program at MIT for rising high school seniors across the US. Many of the students come from underrepresented or underserved communities. They have strong academic records and are interested in studying and exploring careers in science and engineering. ***The OEOP Office is now accepting applications for MITES , Summer 2019!***

Please see the website below for details on the application process:
eligibility, selection criteria, exact summer dates, etc. Last summer the dates were June 23 - August 2, 2018.
http://oeop.mit.edu/programs/mites

What you might not know is that the MITES Program is free of charge for the selected students.
All educational, food, and boarding costs are covered. The students only pay for transportation to and from MIT.

If there are any questions, please have them contact Executive Director Eboney Hearn directly at email: ehearn@mit.edu.

Emerge 2019 Conference
Led by a team of over 30 doctors, our hands-on events allow students an unforgettable opportunity to see and feel what being a doctor or nurse is really like. Our world-class faculty members not only love what they do, but are excited to share their own stories, expertise, and advice with our attendees.
With over 30 hands-on simulation stations, small group Q & A sessions, engaging lectures, and one-on-one conversations throughout the day, we aim to motivate and inspire the emerging medical professionals of tomorrow.

Johns Hopkins Engineering Innovation Program
Engineering Innovation is an exciting, college-level, summer program for motivated high school students with an aptitude in math and science and an interest in (or curiosity about) engineering. This program has been

available to high school students since 2006. In the program, students learn to think and problem-solve like engineers and have the opportunity to earn Johns Hopkins University (JHU) credit. The application deadline is February 15, 2019. Financial Aid is available to qualifying students.

Learning Opportunities (Teachers)

San Diego County Office of Education Professional Development
This SDCOE catalog summarizes a variety of professional learning opportunities for science educators. Sign up for county updates here.

Fleet Institute's Teachers Eating Pizza
Teachers Eating Pizza is an educator workshop at the Fleet Science Center that occurs on the first Wednesday of each month. Come for the pizza, converse with colleagues, learn curriculum-ready interdisciplinary content related to the month's topic and attend the 7 p.m. The Sky Tonight Astronomer-led planetarium show in the Heikoff Giant Dome Theater. Following the workshop, the San Diego Astronomy Association invites you to view the stars through telescopes on the Prado during their monthly program Stars in the Park. The following topics are emphasized in the workshop and planetarium. The topic of the educator workshop may vary from the planetarium show to be more in line with Next Generation Science Standards.

Fleet Science Science Teacher Learning Opportunities
The Fleet Inquiry Institute is the teacher professional development arm of the Fleet Science Center's Education Department. For additional information about current programs please contact the Fleet Inquiry Institute at (619) 238-1233 x722 or by email.

NGSS/Achieve Science Review Panel
Achieve's Science Peer Review Panel ("Science PRP") is an elite group of educators who work to evaluate and share high-quality lesson sequences and units that are designed for the Next Generation Science Standards (NGSS). Members of the Science PRP are part of the solution to a persistent problem in the science education field: not enough examples of high-quality instructional materials designed for the NGSS. Join the Science PRP by filling out this online application and connect with a network of educators across the country committed to advancing science education for all students, develop your expertise in the NGSS, and work to make better science instructional materials more widely available to the science education field. This opportunity includes free, valuable professional learning experiences designed to deepen your understanding of the NGSS and the evaluation process for instructional materials.

Young Hacks Academy
YHA is looking for a teacher and school to partner with. If you are interested, contact Program Coordinator Tom Baacon at tbacon@younghacksacademy.com.

Science and the Public's Advocate Grant Program
We invite you to apply for the Society for Science & the Public's Advocate Grant Program, which provides a $3,000 stipend and training to an individual (teacher, scientist, counselor, or mentor) who agrees to serve as an advocate for 3-5 underserved students to transition them from conducting scientific or engineering research projects to completing applications to scientific competitions. This year the program has added three new Advocate roles, expanding eligibility for the grant and allowing more experienced teachers and mentors to further expand their student research programs.

Many students doing science research are not aware of the myriad of opportunities that are attainable by submitting their work to competitions. Just completing the rigorous application process can inspire confidence in their scientific abilities and lead them to consider a STEM career. Many competitions provide monetary

awards for post-secondary education and can boost a student's chance of acceptance into the college or university of their choice. Too few underrepresented students are presented with these opportunities and often lack the know-how to successfully enter.

For eligibility information and to apply for the Advocate Grant Program, click here. Advocates must already have a formal role with students completing research projects. This program is sponsored by Arconic Foundation, the Jack Kent Cooke Foundation, and Regeneron. Application Deadline: March 5, 2019

San Diego Bite of Science

Mark your calendars! The San Diego Bite of Science returns next month on Tuesday, February 19th. As you figure out your PD plans for the new year, why not consider spending an evening hearing about exciting science research and engineering and connecting with local STEM professionals over dinner? Bite of Science is a free, interactive dinner workshop bringing together middle and high school teachers with scientists and/or engineers from industry, academia, or government. Attendees hear about exciting science and engineering research and development in the local community, learn about STEM careers and outreach opportunities, network with the speakers and peers from within and outside of their district, and find out about TEP's free resources and CEE's student programs.

Cornell Summer College for High School Students

Cornell's Summer College is one of the nation's longest running and most highly regarded precollege academic programs. It brings more than 1,500 academically talented high school sophomores, juniors, and seniors from around the world to the Cornell campus in Ithaca, New York, each summer for three- and six-week programs. Financial aid is available.

Summer College students have the opportunity to:

- experience what it's like to live and learn at a great Ivy League university,
- take real university courses,
- work closely with Cornell's world-renowned faculty,
- earn three to six college credits,
- explore majors and career options,
- get a jump on successful college applications,
- make friends from around the world, and much, much more.

2019 Geothermal Design Challenge

On behalf of the U.S. Department of Energy (DOE) Geothermal Technologies Office (GTO), the Frontier Observatory for Research in Geothermal Energy (FORGE) and the Idaho National Laboratory (INL), I'm very excited to inform you that the application window for the 2019 Geothermal Design Challenge™ is now open and we need your help to find qualified students.
Who can enter: Teams of two or three currently enrolled students from any U.S. high school or university, including graduate students.
The Challenge: Student teams will research datasets, interpret information and create a data visualization portfolio that tells a compelling story about the search for clean, renewable geothermal energy.
Application Deadline: April 10, 2019

Learning Opportunities (Students and Teachers)

Salk Institute 29th annual March of Dimes High School Science Day

Once a year, the Salk Institute opens its doors to hundreds of students and their teachers for an extraordinary day designed to ignite interest in life sciences and introduce them to scientific research career pathways. The day includes Salk scientists sharing stories of their work life, lab tours and the opportunity to participate in current experiments. This program is generously supported by the Anne and Neal Blue High School Science Fund. The 2019 March of Dimes High School Science Day will be February 23, 2019. Registration closes February 8, 2019.

UCSD Reproductive and Oncofertility Science Academy

UCSD has had this student academy for high school female students for years, but are just now offering a teacher program as well. It is open to middle school and high school teachers. The website on the high school academy lists the dates and details from the program. Thanks to Tania Kim for sharing!