

Next Generation Science Standards Summary

Background: As many of you know, the Next Generation Science Standards was preceded by a framework, which carefully spells out the philosophy of this new model for science education.

In that framework, the authors identify eight science and engineering practices that are reminiscent of the scientific method, but are seen as an integrated part of all our science instruction, rather than a sequential set of lessons to be taught at the beginning of a year, or separate from other content. The framework also introduces a strand of cross-cutting concepts, which include aspects of phenomena that can be observed across disciplines, such as scale, patterns and cause and effect, and which, when viewed through the right lenses and the right time, have the power to help students create paradigm shifts. Finally, the framework carefully narrates the story of our science learning -- of what it means to study 'life' as a kindergartner, a 4th grader and later, a biology student. It lays out the spirals of 'big ideas,' which, if begun in early grades and traced upward, would produce truly strong science citizens.

The standards themselves were then developed over several years by a consortium of 26 states, populated by researchers, educators and policy makers, and was opened to the public a number of times for comments and revision. The document was finalized in April 2013, and since then 13 states have formally adopted them. This approach better reflects what scientists actually do and their ways of learning how the world works. In addition the standards include new content reflecting our changing world, such as climate change, genetic evolution and wave communications.

Process: Over the course of this year, a group of about 20 elementary and secondary science teachers, representing all grades and all sites, has been meeting monthly since September as part of the LCAP provision to provide professional development for Common Core and NGSS

teachers. For several months both groups grappled with the Scientific and Engineering Practices, and shared different experiences about attempts to explore NGSS in the classroom.

In January, with the help of Arthur Beauchamp, Senior Director of Professional Learning Systems in the Department of Education at UC Davis, and one of the leaders of ISTAR, a STEM-based grant supporting Davis and Dixon teachers, we shifted gears and turned our attention toward the question all districts are facing: how to implement NGSS, and when to begin the implementation. Arthur guided us in choosing a decision-making model. By a unanimous vote, we agreed to go with a consensus model, where the minority agrees to embrace the majority view unless a ‘fatal systemic flaw’ can be found.

The first task concerned the sequence of topics for grades 6-8. The State of California has identified a path of integrated instruction for middle school as the ‘preferred integrated model,’ but has also allowed for an alternative, topic specific model. The national model only lists the standards in a grade 6-8 band, without assigning specific topics to specific grades. However, the integrated model is widely supported by researchers as representing what the most successful countries seem to be doing with their science education. While we as science educators recognize that there are a wide range of ways in which ‘integrated’ may be interpreted, ranging from simply offering one topic after another (a ‘coordinated’ model) to all topics being integrated into projects throughout the year, we still believed that any version of integrated, which will expose students to multiple disciplines each year, has a greater capacity to engage learners and to give them multiple opportunities for understanding and making connections. After much discussion and debate, we are recommending, by consensus, that DJUSD adopt the integrated model for grades 6-8.

We are also recommending that the NGSS be implemented in grades 4-8 beginning in fall of 2015 (see attached implementation plans). This does not mean that classrooms would fully reflect all the standards right away, but that teachers would begin using the sequenced topics of NGSS to inform their instruction, and then integrate parts of the NGSS as they are able, and with

the help of our professional development team. The plan includes taking on a mix of subjects new to NGSS and some that will move around and over three years focusing professional development time on those lesson series. We plan to work with a ‘lesson study’ model, where small groups devise lessons, implement them and observe each other’s classrooms, in order to revise and ultimately have robust lessons to share with others.

We will be looking at our materials and making a recommendation for resources and equipment that will ease the transition time, knowing that better, NGSS-aligned materials will be available in a few years. There are a number of NSTA approved materials that prove helpful in creating lessons, for example and we already know that we will need some additional science supplies, such as cell materials to teach 6th grade and ecosystem materials to teach at 7th. However, most of our physical materials will come from already existing labs.

Impact on Testing: As the state of California isn’t expected to have assessments ready until Spring 2019, we have a number of years to explore the implementation of the standards, integrate the cross-cutting concepts and focus on making sure our instruction is practices-centered and be ready for those assessments once they are in place. In the meantime, our students will be required to take the federally mandated California Standards Test in Science in grades 5, 8 and 10. As we anticipate teachers making the shift from the old standards to NGSS, there are some topics that do not overlap by grade level. Students may still see assessment items on these topics and may have difficulty answering such questions. For all other topics, it is our belief that the NGSS approach better prepares students for any kind of assessment, and in fact, we think this approach will give them reasoning skills to handle even content they don’t remember seeing. Regardless, we see these federal tests as a necessary part of our system, but not relevant to the classroom experience we will be endeavoring to build.

5 th grade test	Topics not in NGSS, still on CST
	Human body systems Weather, including pressure systems and weather maps Photosynthesis and cellular respiration

	Rocks and minerals Electricity and magnetism
8th grade test	Topics not in NGSS, still on CST
	All topics continue into NGSS
10th grade test	This test is a general test, covering content from all disciplines for several years. We don't anticipate any negative impact on students taking this test, other than the lack of earth science which has been an ongoing challenge.

Next Steps: We recognize two grade groupings not yet addressed: primary elementary and high school. For primary, we do recommend that the district consider resources and begin thinking long term about supporting science in the primary grades in some of the following ways: coaches in the field, to model and mentor the teaching of science; professional development for primary teachers in how to use existing materials to teach NGSS; science specialists to teach primary grades twice a week.

The high school course sequence, for now, remains unchanged. Over time, they will need to make decisions about how to incorporate the earth sciences into the existing courses, or whether to offer other 'D' elective courses, and they have the option to create integrated physical science courses as well, which could combine aspects of physics and chemistry together. For now, it's unclear exactly what UC and other universities will support as qualifying courses, and for biology, physics and chemistry there are new standards to implement within the existing courses.

We plan to continue our professional development, through the summer and next year, focusing now on the practices and how they can be implemented in our classrooms, and on designing specific lessons for the topics outlined over the next few years. Not everyone is equally excited about this, but all who have wished to be a part of the discussion have had the opportunity to be, and so we have reached a consensus that we think will benefit students without unduly burdening educators.

