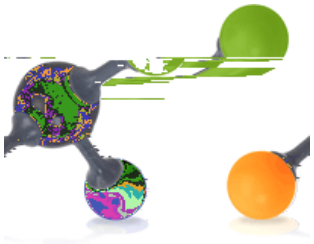

The NGSS and STEM Instruction: Two Intersecting Initiatives

Ed Robeck

The Next Generation Science Standards (NGSS)[i] have emerged at a time in which the NGSS was based, lead to questions about the relationships and differences between STEM and NGSS. Is the NGSS really a set of STEM standards? To understand what makes the NGSS distinct in some important ways from STEM instruction, it is helpful to consider the rationales for these two important initiatives, and for science education more generally.

The impetus for including integrated STEM instruction in preK–12 classrooms and in higher education is largely justified by a workforce imperative.[iii] That is, there is great concern that in the United States, not enough young people are being trained in STEM fields such as engineering, computer science, geoscience, electronics, and so on, to replace the current workers in those fields who are going to be retiring relatively soon, or to address the increased need for such workers that will come about as societies depend increasingly on emerging and sophisticated technologies. In addition, STEM education is seen as a vehicle by which the United States will continue to be at the forefront of technological innovation, especially in ways that enhance economic opportunities, improve the quality of life, and ad4( )]TJ To0D b67(q7(ov))6(i-8(r)70(om)s)4(saT* o Pa6

engineering applications. Yet, within the NGSS, too, there is the opportunity for students to consider the interplay of the natural world and designed systems, such as by considering how the structures of living things can be used to solve human problems (e.g., 1-LS1-1). In this way, the NGSS and STEM initiatives are in harmony with each other.

The different emphases of STEM and NGSS are definitely complementary and, depending on how they are implemented, they have the potential to intersect each other at several points. Understanding how physical laws operate is essential for understanding how the designed world works. Bridges, clothes, pencils, computers, and other technologies all operate through principles that define the interactions of forces, energy, and matter. Understanding how designed systems affect other aspects of the world depends on such fundamental knowledge that comes from basic science. While STEM instruction may begin with a focus on the designed world, a full understanding of the designed world depends on also understanding systems that have not been altered by people—what are sometimes called natural systems (though that can beg arguments about what is and is not natural[x]). Similarly, while the NGSS includes aspects of basic science that are relevant outside of engineering and design processes, it also promotes an understanding of those processes and practices even among students who are not going to take part in science or engineering professionally.

[iii] For example, see: U.S. Congress Joint Economic Committee, (April 2012). STEM Education: Preparing for the Jobs of the Future. http://www.jec.senate.gov/public/index.cfm?a=Files.Serve&File_id=6aaa7e1f-9586-47be-82e7-326f47658320

[iv] White House press release, "President Obama Launches 'Educate to Innovate' Campaign for Excellence in Science, Technology, Engineering & Math (Stem) Education," November 23, 2009. http://www.whitehouse.gov/the-press-office/president-obama-launches-educate-innovate-campaign-excellence-science-technology-en

[v] For example, see: Inspire STEM USA http://inspirestemusa.org/

[vi] Subotnik, R., Orland, M., Rayhack, K., Schuck, J., Edmiston, A., Earle, J., … Fuchs, B. (2009). Identifying and developing talent in science, technology, engineering, and mathematics (STEM): An agenda for research, policy, and practice. In Larisa V. Shavinina (Ed.), International Handbook on Giftedness (pp. 1313–1326). New York, NY: Springer.

[vii] For example, see: NASA Engineering Design Process. http://www.nasa.gov/audience/foreducators/plantgrowth/reference/Eng_Design_5-12.html

[viii] Beal, S. (2013, August 30). Turn STEM to STEAM: Why science needs the arts. Huffington Post. Retrieved from: http://www.huffingtonpost.com/stephen-beal/turn-stem-to-steam_b_3424356.html

[ix] For example, see: http://www.nextgenscience.org/three-dimensions

[x] For example, see: http://undsci.berkeley.edu/article/natural