Implementation of Next Generation Science Standards and Education Reform

Workplace Analysis

Garry Joseph  SED 690
Introduction

I’ve been teaching middle science for the past 10 years, starting my career at Emerson Middle School in West Los Angeles and then moving in 2011 to Millikan Middle School in Sherman Oaks, CA. I am currently pursuing a Masters of Educational Technology degree at California State University of Northridge with an emphasis on science instruction as well. In the last few years, most public school educators have been asked to tailor their instruction towards new national standards, called Common Core State Standards (CCSS). Implementation of the standards has been problematic for several reasons, and the controversy about them is intensifying as the standardized assessments roll out this spring. A few years behind in their scheduled implementation are the Next Generation Science Standards (NGSS) that have been officially adopted by California and most states. As a classroom teacher, my worldview is to advocate for the profession of teaching and to defend it against the many attacks it is under. At my school site I participate in departmental meetings and collaborations with colleagues. We are all challenged to implement the standards as a team and my position allows me to be an active observer of this process.

Context

These new standards (both CCSS and NGSS) should not be separated from the political and economic context they were introduced in. All parties in the public education debate appear to agree on the importance and the need for a public commitment to fund education. The political extremes range from self-described “reformers” attempting to disrupt a system they claim is failing, to teachers and their unions seeking higher wages and better conditions in schools.
Beyond the rhetoric, it appears that the CCSS have been financed and promoted by the reform group, not the teachers responsible to teach to them. To understand the movement towards national standards, one should learn about the history and rationale behind them. (Ravitch, 1996)

The CCSS are part of a series of attempts to reform public education. Other techniques include newly revised standardized testing on computer devices and linking teacher rights to due process (tenure) to those student assessment scores. The CCSS apply primarily to English Language Arts and Mathematics, although all teachers nationwide have been directed to address them. Most teachers, especially Math and English teachers, have learned about the standards in some form of training or professional development. A question teachers ask is “What is the curriculum?” for Common Core, and the answer is that Common Core is not a set of curriculum, but guidelines towards building and adapting curriculum. As of yet there is no official curriculum and educator attempts to implement the standards and parent feedback have been controversial.

**Statement of Need**

The obvious question for educators and their students and families facing the spectre of high stakes testing is “What’s on the test?” and the answer to that in many states is the Smarter Balanced Assessment Consortium (SBAC) which was field tested last year and “counts” this year. Both sides seem to be resigned to the likeliness that test scores across all demographic groups will decrease substantially with the new tests. Educators are concerned that as a result they and the public education system as a whole will be judged a failure. States were persuaded
by the US Department of Education to adapt the CCSS and SBAC as a condition for receiving federal Race to the Top funds. As parents begin to observe the impact of the new standards but especially the assessments on their children, and while teachers scratch their heads trying to make sense of the standards, a backlash appears to be brewing. Some parent groups are organizing to opt out of the testing altogether, which is their right. Educators may also be opposed to the tests, but they are required to administer them and prepare students to be successful on them, so they may not feel safe to be too vocal with their opposition.

In this atmosphere of change and controversy surrounding the CCSS for Mathematics and English Language Arts, comes another new set of national standards for Science. It might be too simplistic to label the Next Generation Science Standards (NGSS) as the science version of CCSS, but in some respects they are, and certainly they are designed to work in tandem with Common Core. Like the CCSS, divining the funding sources for the NGSS is not a simple process. Most states already had adequate science content standards, but NGSS is an attempt to nationalize them. At first, second and even third glance, the NGSS are just as confusing and complex to decipher as the Common Core. When a teacher asks for the curriculum, the answer again is that NGSS is not a set curriculum but are instead standards by which to shape and adapt curriculum. Teachers and administrators are therefore “free” to do the real work of developing curriculum, but they will be judged by how well their curriculum is adapted to the new standards and presumably student performance on the new assessments. When asked about the new assessments, teachers are notified that they don’t officially exist yet and are in development. Significant amounts of the educational budget have been devoted to professional development for teachers but has not resulted in transformational change to the profession. (Slepkov, 2008)
Proposed Solution

Public school science teachers planning for the future now face a unique set of circumstances. For practically all teachers, meeting the new standards will require a significant effort to revamp both curriculum and teaching style. The more veteran teachers will likely offer more resistance to the changes. Newer and less experienced science teachers will likely be more enthusiastic towards the new standards, perhaps sensing an opportunity to assume a leadership position or help determine curriculum.

This will be an opportunity for newcomers and oldtimers to work on the “resolution of underlying conflicts”. (Lave and Wenger 1991) There is a concern that there will soon be a teacher shortage as veteran teachers retire and fewer college graduates choose to pursue teaching as a career. I think we need to honor and value the oldtimers, not alienate them and push them into retirement before they can mentor a new generation of teachers. As Lave and Wenger defined it, legitimate peripheral participation is both “the development of knowledgeably skilled identities in practice and the reproduction and transformation of communities of practice.”(Lave & Wenger, 1991)

As a teacher with just over 10 years of experience, my situation falls somewhere in the middle between oldtimer and newcomer. I know enough to have opinions about what good teaching and good curriculum is, but I am open to innovation and disruption if they are pedagogically sound. Maybe it’s my diplomatic middle-child nature playing itself out again but I think that I might be able to help bridge the gap between the traditional teaching styles and the
disruptive extremes of flipping the classroom or using software models to deliver content
instruction.

Implementation of the NGSS in the science department at my middle school is the primary
challenge in my workplace, and is therefore the subject of this analysis. I am going to examine
how the new science standards are being perceived and implemented at my current middle
school work site. The science department at Millikan Middle School consists of over 14
teachers, all but one of whom have more years on the job than myself. Our Department Chair,
Mr. Carlos Lauchu, leads our meetings and also heads a separate school, The Science Academy
at Millikan. The Science Academy selects the top academic students from throughout the district,
and Mr. Lauchu teaches an AP curriculum that is not seriously impacted by the NGSS. When I
first started working at Millikan I was careful to do more listening than speaking as I took stock
of the attitudes of my colleagues. Of course our meetings are often forced and mandatory events
that easily lend themselves to grumbling and complaining. While I want to discuss the NGSS and
be proactive with implementation, speaking about them at a department meeting can be the
flashpoint of a heated argument or worse yet, an atmosphere of resigned apathy. My challenge is
to establish myself as a good colleague and then gradually introduce strategies and ideas that
may help our department address the standards.

In the previous school year I applied to and was accepted into the LAUSD Common Core
Fellow program of professional development, in which I spent several Saturdays learning about
the new standards and strategies to implement them. While I do not consider myself an expert on
the NGSS or science curriculum, I have enough experience in my classroom to have a good
sense of what works for me. Being the “messenger” for NGSS at my school site was an
uncomfortable role, and I deliberately declined to continue in the district program. Instead of
doing LAUSD sponsored Professional Development, which throughout my career has proven
itself to be generally of inferior quality, I sought out training in a new curriculum, written by
experts I admire, that has teaching strategies supportive of NGSS thoroughly embedded within
them. Rather than talk it up to my colleagues, I have chosen to quietly pilot test the curriculum
and reflect on its success and challenges in the process. By the end of this school year I will be
poised to share from experience some teaching strategies and curriculum that may be beneficial
to the practice of my colleagues.

To build an effective community of practice, the trust of the social bond must exist.
Colleagues need to feel like partners, not adversaries, and while my experience is sometimes the
opposite of that, what I can do is communicate my viewpoint and meet my colleagues where
they are. At the next departmental opportunity, I will survey my colleagues on their experiences
with the NGSS, their attitudes towards the education reforms in general, and their morale. I’ll
continue to focus intensely on personally adapting my teaching practices to the NGSS and then
choose my spots to share about them with my colleagues.

The NGSS provides an opportunity to focus on science as process more than memorization
of content, but inevitably there will be a standardized assessment to measure something and at
that point teachers will teach explicitly to that content. The solution to this problem exists in
determining exactly what the assessable content of NGSS will be and what the current consensus
is on assessment options. This paper will further research existing prototypes for common or
standardized science assessments based on the NGSS and highlight professional development
cases that are showing promise of success. (Krajcik, n.d.) In the trainings I have attended as a
Common Core Fellow in the LAUSD, a rubric to align curriculum with the NGSS was shared, called the “EQuIp” rubric. (Rouser, n.d.) Developing assessments for the NGSS is going to be a difficult negotiation that will require expert understanding of the NGSS themselves. (Pellegrino, n.d.) It is likely that established corporate powers in the business of student testing will dominate with professional development imposed on teachers rather than created by teachers. (Reiser, 2013) The challenge to assess the NGSS include interconnecting science and engineering practices, disciplinary core ideas, crosscutting concepts; recognizing learning progressions; including engineering; addressing the nature of science, and coordinating with Common Core State Standards. (Bybee, 2014)

**Evaluation**

As I reflect on the climate of education reform and new standards, I am reminded that these are very challenging times for working teachers on the front lines. To make the case for adapting teaching practices to new standards in a skeptical community, I’m also going to argue in favor of significant changes to the culture and profession of teaching itself, based on social learning theory and the needs for communities of practice to reproduce themselves. Teachers at my school meet together in content-based professional learning communities and this is where we could be working together to implement the NGSS (Hite, 2013) Reformers and teachers alike are both seeking an authentic method of measuring teacher quality and scaling up best practices. Recognizing how teacher skills develop through legitimate peripheral participation and identifications with communities of practice makes the impetus for structural change to the profession even more compelling. The guiding light between politicized extreme will necessarily
be a discussion about what is in the best interests of the students as individuals and for the collective society. I have found that a sincere consideration of what is best for students can lead to effective innovations and consensus building.

An interesting question to discuss is “How do teachers learn how to teach?” All agree that new teachers require time and need support to develop their skills, but how good of a job does our current system do in developing and replicating teacher talent? It appears to me, working in the trenches, that it does a terrible job. Only the most motivated and dedicated teachers make the effort to form communities of practice. Most teachers continue to be isolated in their rooms most of the day, left to find their way by themselves with their work known only to themselves. Many teachers gravitate towards teamwork and collaboration, and there is near universal agreement about the need for collaboration across and within curricular departments. Science teachers at my school could certainly be a community of practice which is defined as “groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly.” (Wenger, 2014) The cultural structure for such collaboration in public schools is not widespread. Perhaps we should recognize that “mastery resides not in the master but in the organization of the community of practice of which the master is part. A learning curriculum is essentially located…. it is a characteristic of a community.” (Lave & Wenger, 1991)

Educational research delves deeply into defining learning and the circumstances in which it occurs. We know that there are real learning experiences outside of the formal classroom environment or the teacher prescribed curriculum. Leading educational researchers have studied
learning outside of the confines of formal schooling. (Brown, Collins, & Duguid, 1989) Teachers learning about NGSS will most likely pick it up from self-directed reading or visiting a place like the Exploratorium or attending an NSTA conference. People learn what they need to learn and when they need to learn it, via legitimate peripheral participation (Lave & Wenger, 1991). In the case of teachers being ready for the NGSS, the success of the implementation will rely upon the quality of the collegial collaboration.

Here’s my radical but common sense prescription for education reform: all teachers should be team teachers, working in the classrooms no more than 3 days a week. The other days are times they could be doing (and thus learning) some administrative duties, dissolving the wall of separation and adversarial hierarchy between the camps. Teachers who understand and can accomplish administrative duties are more likely to respect, understand and work cooperatively with administrators. Administrators who teach at least an hour day maintain their connection with the core mission of education and more easily empathize with teachers.

Even more ambitious educators could be performing (and thus learning) educational research. Prior to the acknowledgement of social learning theory, educators did not fully recognize the relationship between knowledge and experience (Brown et al., 1989), but by gaining more diverse experience, more diverse knowledge would result. The gap between research and its implementation would shorten. Meanwhile, the salaries of some administrators and grant funds spent on research could be absorbed into the salaries of these more highly qualified teachers. The more attractive salary scale might recruit more potential teachers and earn
the respect deserved for the profession. Most importantly, students would likely benefit from having more adult supervision and overall professionalism in the school environment.

If teachers learned through practice the inner workings of the administrative and research spheres, they might be better poised to shape their schools for the benefit of their students. Through communities of practice, teachers could professionally evaluate each other with an authenticity that would satisfy all stakeholders, thus solving another thorny problem. Lave and Wenger also pointed out the need to recognize “unequal relations of power” and that “hegemony over resources for learning and alienation from full participation are inherent in the shaping of the legitimacy and peripherality of participation in its historical realizations.” Curricular reform and the discussions surrounding it must be conducted by professional teachers who can demonstrate and reproduce their teaching skills. When Lave and Wenger analyzed apprenticeships, they found “very little observable teaching; the more basic phenomenon is learning.” (Lave and Wenger 1991) We would need an ongoing feedback loop in a community of practice where teachers demonstrate their learning to each other and through student achievement.

Without question such a seismic shift in the teaching profession would steepen the learning curve for new teachers. Much of the current pressures, accountability, class size, and workload would have to be adjusted and shared by more people. By replicating successful apprenticeship models, the public education system would become teacher-centered because all participants in the system would “face” students and be responsible for student outcomes. According to Lave
and Wenger, “participation is always based on situated negotiation and renegotiation of meaning in the world.” As teachers busy themselves with new responsibilities, they will recognize that “learning involves the construction of identities; identity, knowing, and social membership entail one another.” (Lave and Wenger, 1991)

The challenges inherent in the implementation of the Next Generation Science Standards provide an opportunity for teachers to begin to engage in this discussion. Since there’s not yet an official curriculum or standardized assessment, science teachers can work together to ensure that authentic student needs stay at the center of curricular changes. While technology promises to make national lesson databases available to all, there is still a culture of teacher isolation in the classroom itself. Researchers suggest that we move away from didactic models of instruction and apply social learning theory to the classroom. (Barab & Duffy, 2000) Approaches to the design of practice fields as suggested by Barab & Duffy include doing domain-related practices, taking ownership of the inquiry, and most powerfully the development of coaching and modeling skills. Barab & Duffy suggest that “the teacher's job is to coach and model learning and problem solving by asking questions that students should be asking themselves.” When teachers are teaming to help each other improve, it’s not simply about finding “the right answer” as it is asking the kinds of questions an expert teacher would ask. Changing the structure of the teaching profession to balance the demand for delivering student instruction to all participants would also embed desperately needed opportunities for reflection, which “should be central in the work environment as well.” (Barab and Duffy, 2000)
Conclusions

These speculations on education reform help me frame my approach to sharing strategies to implement NGSS at my work location. I expect resistance, and it’s important that my colleagues know my advocacy viewpoint. One way to deflect antagonism towards being a messenger for NGSS will be to assert that my presentations are part of a CSUN study. I will collect informative feedback from my colleagues using Google Forms at the close of each professional development presentation. With the permission of the department chair and school principal, I will analyze teacher feedback from the forms and interview informally any colleagues who choose not to participate. Questions on the surveys will attempt to ascertain teacher familiarities with specific aspects of the NGSS and the types of assessment questions expected in the next few years. I’ll use this feedback to plan new presentations and build a network of teachers willing to adapt to the new standards.

Some of the knowledge I will share will come from commercially available middle school science curriculum that uses project based science units, such as “It’s About Time Publishing” and how it addresses the NGSS. (DeBarger, Penuel, & Harris, 2013) Designing assessments is a very complicated discussion that requires literacy of the NGSS as a prerequisite, which is why it is so important to engage my colleagues in discussions about the NGSS. Similar to exponents of the CCSS, the experts in the NGSS tend to not be actual classroom instructors, and that doesn’t bode well for implementation. Within the LAUSD Science Branch, I’ve been invited to help pilot a new curriculum called IQWST, which integrates Physics, Chemistry, Biology and Earth
Science across all three years of the middle school cycle. This curriculum may come close to being an “official” curriculum as it is authored by one of lead writers for the NGSS. (Krajcik, n.d.) It is an exciting curriculum, however I have already committed to piloting a different curriculum this year, a new GEMS Curricular Sequence developed by the Lawrence Hall of Science at UC Berkeley. I attended a three day training over the summer and am in the process of teaching the unit in my classroom this semester. Many of the pedagogical techniques I am learning can be applied to existing traditional activities, and I will attempt to share these with the science department at my school this year.

**Preliminary Conclusion**

The good news is that teaching well is not likely to go out of fashion. My experience teaching the new GEMS unit includes a focus on student dialogue with each other in pairs and groups of four, a strategy many teachers already routinely apply. The NGSS emphasizes “argumentation from evidence” as a central practice in science, and the GEMS unit includes daily reinforcement of this. Strategies such as Active Reading involving students making detailed annotations on selections of text are easy to adapt and use. The annual Science Fair project can be modified to include many of the Science and Engineering practices outlines in the NGSS.

By the end of the school year, several teachers in the LAUSD will have pilot-taught the IQWST curriculum and I will meet with them to discuss and compare experiences with the different curricula. If I can’t help make a community of practice coalesce at my current job site, I will simply cast a wider net to make connections with others who share that vision.
References

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