Putting Content in a Can — aka: Creating a Model Science Curriculum

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VEXATION: MODEL CURRICULUM AS THE CURE ALL & THE PHILOSOPHY BEHIND THE FIX

An achievement gap among the students in the "two Connecticuts" continues to challenge those of us in science education. In addition, the fever for quick fixes in the field continues to rage. The mantra for the longer school day and year continues. The academy model at the secondary level gains popularity and the debate specific to merit pay for teachers is endorsed by the President. Even with what I would describe as a long and disturbing list of "fixes," the fix that vexes me the most is the one currently contemplated: a state-mandated model curriculum in life science or biology.

Connecticut is a local control state that leaves instructional sequence, curricula development, text book selection and program decisions in the hands of individual school districts. The state provides a science framework for PreK-12 that identifies the broad content targets for each grade level or course along with the expected performances from which guides the development of state assessment items. Models lessons and units of instruction are not provided by the state. As a result there is a wide range of science courses with varying levels of quality and demand across the state. While it is difficult to disagree with the philosophical reasoning in favor of a model science curriculum I find the prospect concerning on many levels. Certainly I appreciate the need for consistent content and performance expectations for students across the state. And a common curriculum can only afford the growing transient student population with an improved chance for academic success. Still I have grave concerns about the implications for teaching and learning for Connecticut students.

I am not sure there is research that supports the premise that biology or a life science course is the most important high school science course for students nor was I asked for my opinion on the matter before the decision was made for Connecticut students. As the State designee for secondary science, it would seem reasonable at some point to be consulted. The model curriculum implies that there is a one size fits all curriculum in which science content, in this case biology, can be made accessible to all students. This "model" ignores that relevancy of context to a particular population may vary across the state and leaves instructional differentiation in a vacuum. How can one anticipate differentiation needs without a student population in front of you? Granted lessons may be constructed with sensitivity to English Language Learners (ELLs) at various levels of language acquisition. Lessons may be constructed with sensitivity to various learning styles. And yet the model curriculum sounds like magic with the expectation of scripted lessons and assessments that leave little room for a teacher's professional judgment and artistry to come into play.

CORE CONTENT COUNTS

The proposed language for the 10th grade science curriculum is softened to "life science" instead of biology, but the directive is for the curriculum model to be based on the current science framework. I believe the nuance of changing the course title away from biology will help avoid the recreation of "your mother's biology class" complete with yarn models of mitosis/meiosis and Jell-O cell models.

This is a chance to make the break towards a more contemporary blended curriculum that incorporates the use of 21st Century Skills which would include contexts such as biotechnology, forensic science and environmental science to reach students. Students need laboratory experiences, simulations, computer modeling and field experiences situated within their community to appreciate the role of scientific literacy in their own lives. Case studies and local examples of phenomenon and data contemplated in the framework need to be constantly infused and updated into the curriculum.

This vision will be a hard sell as the field of science educators is well populated with those fiercely loyal to the traditional biology class heavy in nomenclature, memorization and non-contextualized content even though it is clear that approach turns students off to science and discourages further coursework in science. To complicate matters even further there is no expectation that the 10th grade State science subtest will go away anytime soon. How can the model curriculum maintain a cutting edge structure and still align with the expected performances on "the test"?

THE CHALLENGE OF BUILDING CAPACITY

Another component of the model curriculum vexation is finding the time, money and talent to develop a quality model curriculum with a multitude of components including model lessons, formative assessments, embedded literacy and of course 21st Century skills under the constraints the bureaucracy demands. The present model Algebra I curriculum effort is falling victim to the unrealistic time-tables and inappropriate expectations. And the professional development necessary to roll out this new model — in addition to the equipment, consumables and technology necessary to do the job right — is daunting. And what about the continued need for consumables, equipment, maintenance and modification of curriculum? Who will evaluate the content and update the curriculum once it is developed? Will this curriculum be on a review cycle similar to the review processes districts are asked to adopt or will this document sit in a static state to die its own death?

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VENTURE: FIXING THE FIX OR JUST FIXATING?

Without proper funding the idea of developing, implementing and sustaining a quality model life science curriculum is unrealistic. I submit that a portion of the grant money from the Math/Science Partnership funds could be set aside for the development of sample units aligned with the 10th grade framework and offered to the field as "possible units of instruction." The key is to provide adequate resources and sufficient time to complete the work in a professional manner. Historically such projects have been implemented with unrealistic parameters and consequently the resulting products are so lacking and that they erode the credibility of the department's competency and credibility. A menu of units that include links to multicultural literature, embedded technology and authentic situations must be a priority. This could provide an exciting opportunity for science educators in Connecticut to create unique, interesting, challenging and relevant units of study for our students. The development team must be open to identifying the content most crucial to build scientific literacy in our students. In addition we must release our hold on predisposed ideas of the content in order to be replaced by material the students will love because it will be the most urgent for all students to delve into. All units must align with the current science framework, but with the broad expected performances for students the framework leaves much room for creativity.

Over the past year an after school STEM program for middle school students was developed, piloted and revised with great success. The development team for each unit was comprised of classroom teachers, informal science educators, industry partners and frequently representatives from institutions of higher education. The units were developed, reviewed by outside experts, piloted and revised again. Participating schools were given the choice of after school units to offer students, the appropriate resources and professional development to support the implementation of the unit. The core instructional pieces of the learning unit were provided to the instructors but pacing, differentiation and assessment decisions were a matter of professional decision-making. With the success this project enjoyed why not build upon the model?

Teachers should be encouraged to differentiate the materials to meet the needs of their students. I am convinced that the professional responsibility and craft of teaching need not be removed from the classroom teachers' hands. The idea of feeding teachers who will in return feed their students leaves me cold. This is an opportunity to invite professional collaboration throughout the development process and continue the collaboration among practitioners in the field who may share their instructional strategies, extensions, etc.

As I think about building social capital to address my vexation there are some possible avenues that others may be of assistance to me:

- Can a recently formed Secondary Science Advisory Panel that addresses content specific issues such as defining what Connecticut means when we talk about a "laboratory science" class take on the task of defining what the content and context of the model curriculum would include?
- Perhaps a new advisory panel could be formed to address the content and inquiry skill expectations of science educators from the college level in collaboration with the secondary content teachers and scientists?
- Should the professional organizations (Connecticut Science Teachers Association and Connecticut Science Supervisors Association) work with colleagues in higher education to write a white paper on the issues of concern specific to the development and implementation of "the model curriculum."
- Instead of re-inventing the wheel do we consider an existing curriculum such as Education Connection's Bio21 course as a "model for curriculum"? Could stakeholders review a series of curriculums?
- Do we build upon the collaborative development model used in the STEM After School and write an RFP funded through Math/Science Partnership funds to develop similar products that align to the 10th grade science framework?

Of course in light of all the constraints at the Connecticut State Department of Education, including financial and personnel limitations, this project may completely fall by the wayside. The unveiling of the Model Algebra I Curriculum and its reception by the mathematics community at large may be the one deciding factor as to the development of any other model curriculum. The CSDE resigns itself to getting out of the curriculum development business all together. Maybe that is not a bad idea!!!