Curicular Change -- Some Lessons Learned

PROF Brian Winkel, Department of Mathematical Sciences,
United States Military Academy, West Point NY 10996 USA

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Prelude

One day a student in my mathematics class came to my office at Rose-Hulman Institute of Technology, where I was teaching applications of mathematics. He said, "Do we have to use the math formulas for projectile motion? Why can't we use the physics formulas." I said to him, "Do you think gravity is different over there?" He did not get it; ANY of it! So that night I went home and wrote a homework assignment entitled, "I Am Sick and Tired and I Can't Take It Any More!" I always titled my assignments, but never this negatively. The assignment was to get the physics text out and show how the little boxed formulae that physics authors package so well came from the development we had been offering in our class. Some of them got it, some did not. I was disturbed that my students were compartmentalizing the very things we were trying to relate, that they were learning inefficiently with little boxes for information instead of broad sweeping themes for success, and that they were not seeing the beauty of the mathematics I loved so well in action.

During the next academic year I applied for support and was funded by The Lilly Endowment to conduct a faculty development seminar with an outside visitor, Dr. H. T. Hanks, Applied Mathematics, Brown University. We gathered faculty to participate in an ongoing seminar about research in inverse problems and parameter estimation in modeling with differential equations. During our time together we also discussed our teaching, our concerns for our students' learning, and our own learning. From these discussions emerged a plan to investigate the possibility of doing something different, of coordinating curriculum efforts, indeed, of an integrated curriculum in first-year science, engineering, and mathematics. This effort is well documented.[2, 4, 5].

That one conversation with a student, those few gatherings of faculty, and many conversations with several of my dear friends at Rose-Hulman lead to a massive effort to change the first-year curriculum in science, engineering and mathematics – ***an effort which eventually failed.***

What I want to discuss here is the process and how it could be changed and thus improved. Basically there are a number of types of players in the complex role of change agent – *visionaries*/*innovators*, *implementers*, and *doers*. There are also other figures in the drama -- *positionaries*, *cautionaries*, and *resistors*. Visionaries and their kindred spirits – innovators - see things as they might be and want to move to that vision, while

implementers attempt to bring about the change, to do the practical things necessary, and to smooth the way for happenings. Doers, actually carry out the vision as implemented. In curriculum innovation the doers do, i.e. they teach and iterate the teaching model. Positionaries sit tight, enjoy the *status quo* and may or may not be good at the *quo*; cautionaries sit on the side lines and caution, perhaps even chide, the others who would move on curriculum change; while resistors do just that – resist.

Player Awareness

Players who would change, who would move, need to be aware of others in the neighborhood; of their interests, of their attitudes, and of their needs. One need we all have is to have a sense of worth and belonging and when change agents propose something different than the current strategy and move in that different direction they need to be aware of the perceptions and reactions of others. Moreover, they need to be sensitive to others and they need to keep ALL dialogues open and fruitful.

Being a change agent is very difficult and few do it well, hence we do not see great changes often. Rather we see gradual changes as a result of many smaller change agents and modest acceptors. Something new on the block is usually the result of some things new on blocks all around the neighborhood and some visitors from those blocks to our block, coupled with a local change agent or two and a bit of luck and opportunity.

Benefiting from the Human Component

During the creative stages of curriculum development the visionaries or dreamers expend enormous amounts of energy on designing and creating the new curriculum, perhaps an all-consuming amount of effort as was the case in the project in which I was involved. While this creating business is very hard to do, developers also need to spend time cultivating others to understand their vision. They need to seek and take ideas and suggestions from others to build a better, more acceptable product. Most importantly, they need to *listen* to colleagues.

I personally, have been a dreamer who has designed curriculum, good curriculum – not just thought so by me, but others have said so. However, because our team did not benefit from the human component of our energy base – fellow faculty. We did not embrace their ideas from the start, nor did we fully involve them and give them ownership early in the development. It could be said that we alienated some; enough, in fact, that when the project could have been upscaled to the entire student body there was too much resistance. While we formed a faculty council to advise the curriculum effort, they thought it was for them to give their new ideas, and we thought it was for them to bless our ideas! So we just did not get it, we did not listen, we were not sensitive to the needs and the potential of others.

There were generic resistors, those that would not change. However, many were resisting because we just did not show them we cared about their ideas, about their contributions. We were dreamers, we were naïve, we were novices in the game of politics of curriculum

change and approval, and we could only keep track of a few things, albeit large things(!) – among them the development of a massive curriculum change effort as well as the assessment and evaluation of this effort. Often in the latter efforts we found ourselves attempting to counter our critics with data rather than embracing them in dialogue, thus alienating them even more at times.

In a paper to appear in the *Journal of Engineering Education*, four members of the Foundation Coalition (a broad engineering curriculum effort sponsored by the National Science Foundation) offer up, "Evolving Models of Curriculur Change: The Experience of the Foundation Coalition." Rose-Hulman Institute of Technology and the curriculum effort of which I was involved was a founding core of the Foundation Coalition. Several evolving models for curricula change are offered in the article with the fourth model being:

1. Develop the curriculum.
2. Pilot it and persuade colleagues to adopt it.
3. Implement it in a form that works for all students and faculty.
4. Devise structures and mechanisms to sustain its continuous growth.

There is a thread that is now understood by all involved. We affirmed this at a small conference of Foundation Coalition alumni at Banff National Park of Canada this summer. (We DO know where to meet!!) That thread is to solicit colleague's ideas, to involve colleagues, to listen to colleague's suggestions, and to weave in the appropriate ideas to make the curriculum effort stronger, to permit others to take ownership, and to build a coalition of believers.

If I knew then what I knew now, I believe I would still proceed, I would incorporate teams to keep those involved more sensitive to the views, attitudes, and potential contributions of all about us as we worked to build a curriculum. Would the curriculum change we worked to build then be still here now? I am not sure. Of one thing I am sure: If anyone does begin a curriculum change and they do not involve colleagues from the start, do not listen, and do not become more inclusive of ideas and people, then that curriculum stands little chance of success. Listen to your intellect, your desire for change, your inner conviction, but also listen to others and bring them into the fold. You will be better for it, your curriculum change effort will be better for it, your colleagues will be better for it, and your students will benefit from your total effort.

References

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