Isa's IOWA COMMENTS

According to the schedule!

OUT OF SCHOOL STEM Deb Dunkhase

"Expanded learnimg"

Hands on, interactive, experiments

Tied to the school curriculum wherever possible and to the standards

Include business folks …can anyone be a teacher…

Boston After School & Beyond

Citizen Schools (can everyone teach?)

Role of informals in STEM

- **play as learning**
- **preparation for what to expect in schools**
- **dealing with diversity**

STEM INNOVATOR PD MODEL **(and associated computer innovation model) Dr. Leslie Flynn**

Educator-Entrepreneur professional development

REGIONAL STEM **Kristine Bullock**

_____

SECONDARY SCIENCE METHODS CLASS, Dr. Mark McDermott

The short form:

Know your stuff,

Know your kids and what they know…formative assessment can be a teaching tool

Be clear about the outcomes

Check out the standards

Principles of good pedagogy

a. balance between basic knowledge without which students cannot understand what they might discover and discovery--hands on, interactive, project/solution based, real world as appropriate challenges

e.g. global STEM program

we teach the content they need for their project and they figure out the solution

b. teaching them how to learn on their own

c. education's equivalent of the sermon: tell them what you are going to tell them, tell them and tell the what you told them

"In math and science, for example, systems-based pedagogy and curriculum encourage the intuitive understanding that is often lost when students learn only facts or technical manipulations without understanding the larger processes at work. We all know that memorizing the technical terms for the elements of a cell in biology is much less engaging than learning how a cell functions as it processes nutrients, expels waste, and maintains its integrity in the face of chemicals that threaten it. The same is true for manipulating equations in algebra or calculus without knowing how the real-life engineering or natural systems these equations describe actually operate." (Peter Senge & Daniel Coleman…Ed Week, Aug 27)

Last summer, as he often does, GOZ gave his five students non-functioning chargers to break apart--giving them hammers, screwdrivers and vises, analyze and put together again. One of the students went immediately to Google to find out how to BREAK the charger. "Is Google making us stupid?" On the other hand you do not have to wait until the next day to go to the library!!!

STORY: My husband, the physicist at Boston University, ran a summer program funded by the NSF (originally started as the RIP program…Research Internship Program) which placed HS juniors who had taken physics (a distinctive group) in the labs of scientists in Boston: his and a few other labs at Boston University, Harvard, MIT and Northeastern. The students were scientists for the summer…

They kept in touch with each other and the program manager after the summer…girls were encouraged and attended in equal numbers. The program was duplicated in several other institutions, even after he gave up the leadership.

This model supports the notion of immersion/internships/ apprenticeships and role playing as excellent instructional strategies: spend a significant amount of time in a lab with a real life scientist, behave like a scientist in that setting…the latter can then influence behavior outside the lab.

Still today, as professor emeritus, he has kept his lab and so a few undergraduates each year…including the summer...ask to work with him.

c. Students need to experience...all four subjects, teamwork, diverse cultures and languages, cutting edge technology including communication technology…David Thornburg's comments about Kindergarteners needing the most advanced technology not HS students

Boston University had a program in which juniors planning to teach spent a semester attached to a teacher in a school

Program models...

Engineering is elementary…the curriculum has three components: a teacher guide, storybook and materials kit.

Iaonis Maoulis (MoS) says: What would it look like here without engineering?

GTEC

Challenges of getting good teachers today from a HS principal and Superintendent's perspective....

coordinated preparation at higher ed, e.g. the clinical school model...Robert Schaffer

internships at the school level for half a year minimal (the medical model) Boston University had a program in which juniors planning to teach spent a semester attached to a teacher in a school

As an English teacher I always proposed that STEM students/studies include novels, drama, short stories, etc connected to the topic…e.g. Marie Curie, science fiction… the development of TV shows such as CSI, Body of Proof, Bones has given students an entry into the importance of science they might not otherwise have….There is a program called SWIVET which encourages/piques the interest of students in STEM

STORY: One day each year at James Madison High School in Brooklyn, NY, selected students became teachers. I was the science teacher with a classroom that had a demonstration table (faucet, Bunsen burner…) I worked with the teacher (a man whose name I no longer remember) to prepare an authentic lesson that I could handle….He remained in the room but did not need to say a word (smile).

4. As a high school principal in Hamilton, MA, I enabled the hiring of a colleague of my husband from Boston University as the physics teacher. He was a very good teacher, a great cook and had a wonderful baritone which he practiced as a member of the Yale Russian Chorus. This was in the late 70's.

One day, three girls in his class came to my office to ask to be allowed to leave his class. In the discussion, they explained that all the examples he was using in the physics class were not interesting to them: cars, equipment, sports….I asked if that was the only reason and they said yes. I also asked if they had spoken with him about the issue and they said no. Normally I would have insisted they do so first, but since he was someone I knew personally I agreed to speak with him…I visited/observed his class and then asked him to meet with me in my office. When I pointed out what the girls perceived, he said he had never thought of that and would, of course, add examples, from cooking, as one possibility.

He did change his examples and the girls remained in the class. This could be interpreted as stereotyping but the request came from the girls themselves and represented their needs at the time. Today I might ask students to let the teacher know their special avocational/vocational interests and use the technology to enable

their learning. And or ask the teacher to ask at the beginning of the course.

5. As a HS Principal and Superintendent, I always looked for the following characteristics in a teacher:

solid knowledge base in the discipline

basic and innovative instructional strategies including the appropriate and necessary use of technology (if at the time he or she did not know how to use a computer, I made it a requirement of hiring to be proficient in the first 6 months)

• control of the English language in both writing and speaking

• willingness to contribute to the school community beyond the classroom

• a sense of humor

The last science teacher I hired was an approximation of the five criteria above because the pool was so shallow.

I asked for portfolios so I could see the quality of work and in the interview I would create role playing scenarios…If possible I

would visit the applicant's school (of course, the teachers in the department or the school would play an important role in this process; sometimes students and parents would also be part of the screening process)

What does the term science mean?…knowledge

Natural philosophy in 16th century…exploration of the puzzle which is presented by the environment…initially precipitated by hostile environment and how to get control of it

Now trying to solve the puzzle of our environment, surroundings, etc. Almost any object can be conceived of as a scientific inquiry…take a piece of paper…you can ask how heavy it is, how it can be folded.

Take an example such as going to supermarket…calculatecost, examine ingredients, weight, volume, origin, nutritional value

Several hierarchies:

need math to understand science… more complicated phenomena and systems—need math and facts which have been gathered to be placed in a pattern

science is exploration and categorization of our surroundings into a logical pattern

science involves various levels of complexity
the study of the simplest phenomena is physics
second most simple is chemistry, next complicated science is biology…many molecules being assembled into an organism and organisms are self perpetuating
basic mechanisms are still physical but to deal with multi assemblies one needs one needs to categorize them to make sense, thus the process is catalog of facts and similarities
next more complicated is sociology which is a social science

John King, a professor at MIT, invented "corridor experiments"
booths in the corridors invited students to explore

He also posited that at birth children should be given 3 toys—not so small that they would swallow them but not so biog they could not handle them…a sphere, a triangle, a cube in different colors from which they could begin to understand shape, weight, property of materials (solid, squishy)…the tactile experience

In Lexington, MA when I was Ass't Super we had science corners

where volunteer parents would demonstrate phenomena for students who were too young to engage in them.

Ed Week (Aug 15, 2014) has an article about systems thinking as a requirement of teacher prep ...Peter Senge was co-author.

The Boston Globe has "magazine" called Parade…in the August 3 edition, there was an article entitled "Building a Better Teacher". It is worth looking at to see what parents are being urged to think about and do!!!

Also read the education news: Ed Week is very useful

STEM…so we have science, mathematics, engineering which is the utilization of present knowledge in order to change the environment; technology is a branch of engineering

The arts are still another way of explaining our surroundings… hence STEAM…but also philosophy…

The benefits of science:
Reduction of impact of many of dangers
Feed the world's population (except where social impacts

interfere)

Extend life span, eradicate many diseases and overall improve quality and length of life with the aid of production, distribution of goods throughout the world

Other observations:

My joke about science is faith…

The story about dissection…appropriate use of computer simulation and projection