

## **COMPILATION: biology teachers like Physics First sequence with Modeling Instruction**

Date: Mon, 3 Mar 2003

From: Jane.jackson@asu.edu (Jane Jackson)

Modelers:

To fill out the story of Physics First at Rex Rice's high school, I interviewed one of the 3 biology teachers, Chuck Collis, by phone. I took notes and e-mailed them to him. He wrote comments about my notes. Here's the report. (Recall that 20% of the 850 students at Clayton High School are bussed from inner city St. Louis.)

Chuck wrote: "You may quote me and use my name, I don't mind."

Biology teacher interview: Clayton HS

Feb. 2, 2003, by phone:

Chuck Collis <charles\_collis@clayton.k12.mo.us> has taught 11th grade biology for 5 years at Clayton HS. Before that he taught for 4 years at a different high school where the traditional sequence was used. (Freshmen took physical science -- a combination of physics and chemistry; sophomores took biology; juniors took chemistry, biology II, physics, or environmental science)

Chuck says that the bottom line is: "**Clayton High School juniors are much better prepared to deal with biology at the molecular level.**" He likes the Physics First implementation!

Clayton High School has 3 levels of biology: regular, honors, and AP. All students are required to have 2 years of science, but almost all students take three years of science and most take 4 years. Some juniors take a different science than biology: for example, AP physics or AP Chemistry.

Chuck says, "95% to 98% of Clayton High School students go to either a 2 or 4 year college, but less than 95% of the city kids go on to college." "The best integration I've personally seen exists between racial and class groups; the community tends to be more liberal and diverse than most suburban communities. The community has a large Jewish population, and many international students live here because of Washington University". However, "a significant achievement gap exists between Blacks and Whites", he said. He thinks that formerly the more academically oriented inner city parents tended to choose Clayton High School for their children, but "some recent rules now keep parents from influencing where kids are bussed to."

Currently he teaches the 3 sections of honors biology. In addition, the school has 5 sections of regular biology, one of which is taught by a freshman physics teacher whose degree is in biology. Chuck has taught regular and honors biology. For the honors sections, the BSCS blue textbook is used. "It's far and away the best that I have used! It spirals..."

Typically about one-third of his honors students have had regular chemistry (rather than honors chemistry); most of them do fine in his course. "Having an entire year focusing on atoms, molecules, and how they behave really makes a difference -- regardless of whether it is at the regular or honors level," says Chuck. (The text for regular chemistry was ChemCom until this year, but it is too short on substance; too shallow a level. The honors chemistry textbook is by Zumwalt, but it has too high a reading level.)

Chuck taught freshman physics for 1 year; he was influenced by Rex Rice. In his biology courses he uses whiteboarding and student discourse. He has good paradigm labs; students design labs, and sometimes they pool data. Each lab group does an oral presentation and writes a report; the report includes standard deviation. He uses concept reinforcement, spiraling, and new contexts. For example, Unit 2 has an enzymes lab; they use the enzyme concept throughout the year.

Students end some units by doing lab practicums where they synthesize their learning; for example, he sets up several molecular models and they must identify them, or he sets up microscopes and they must identify what they observe.

Chuck ended by writing, "Fashioning biology into an inquiry driven process, reflective of the methodologies I used when teaching Freshman Physics, has been challenging and rewarding! I feel that the kids really benefit from that approach. Using modeling keeps me sharp and energized as an instructor. *When kids experience the modeling paradigm, especially over a period of years, they really begin to understand science as a process as well as pick up a lot of important content.*"

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Date: Wed, 12 Mar 2003

From: Jane.jackson@asu.edu (Jane Jackson)

Biology teachers like Physics First with Modeling Instruction!

Last week I posted comments on this question by Chuck Collis, a biology teacher at Clayton High School. Below are comments on the same question by Craig Sucher, another biology teacher there. Craig gave me permission to post this, and to post it on our 'compilations' webpage:

<<http://modeling.asu.edu/listserv.html>>.

cheers,

Jane Jackson

Date: Thu, 20 Feb 2003

From: Craig Sucher <[sucher@clayton.k12.mo.us](mailto:sucher@clayton.k12.mo.us)>

>How do you like it, in your biology courses, having 11th graders?

>Especially since most of them have had Modeling Instruction rather than

>traditional lecture/demo/cookbook lab methods in 9th grade?

I taught biology to sophomores at a regular level who had not previously had chemistry for one year, and I have been teaching with our current sequence for the past 5 years at the regular, honors, and AP level. I can say without hesitation that the current sequence is much more "comfortable"

when the curriculum is a molecular approach to biology as ours is. I say "comfortable" because in the previous and more traditional sequence we would continually find ourselves in the "uncomfortable" position as teachers by prefacing lessons with something to the effect of, "Here is a little of the chemistry you need to understand this biological concept; you will understand the chemistry better at the end of next year." Truly, "comfortable" and "uncomfortable" can be decoded to "effective teaching and learning" and "ineffective teaching and learning".

I really haven't taught biology (this is my 7th year of teaching overall) in a curriculum that's different from a molecular approach, but I really can't imagine teaching biology any other way. The concepts of stability and reactivity of molecules relating to why two atoms or molecules might or might not react with one another really forms the basis of biology at a molecular level. Certainly closely related would be concepts of energy conversions, which were nurtured in both the freshman physics and sophomore chemistry courses and are continually tapped as we move through our course.

Comparing student preparedness with a previous modeling experience as opposed to a more traditional approach is a difficult one for me to comment on, because I haven't taught biology to students who have had a traditional approach. I can say in the absolute, however, that the juniors in our program are very comfortable analyzing data and graphs and also with experimentation in general.

>What modeling strategies do you use in biology? (ex. whiteboarding,

>Socratic dialogue, circle whiteboarding, student-designed labs, lab

>practicums, focusing on models rather than topics, explicitly).

We use whiteboarding, Socratic dialogue, lab practicums, and student-designed labs.

>Do more students take advanced biology, as a result of the 'physics first' sequence?

Again, it's hard to determine the causality of student decisions and I don't really have any comparison, but I do know that we routinely have full sections (20+ students) of AP Biology in a school of 850 to 900 students.

>May I post your comments to the modeling listserv, and put them on our web site? And may I include your name?

Please feel free to post my comments and use my name.

>How many sections of AP biology do you have this year? Is that a second year course?

We have three sections of AP Biology. It is a second year course for some and the first biology course for talented juniors who typically if not exclusively have been in Honors Physics and Honors Chemistry as freshman and sophomores.

>This year, how many sections of regular biology are you teaching? of honors biology?

I am teaching three sections of regular (there are two others), and one section of Honors.

>What textbook do you use in regular biology? *How* do you use the text - mostly as a reference?

We use the Glencoe text (whale on the cover). The text is not written as a molecular or biochemical approach (actually it might purport to but doesn't, to the level that we teach and learn). In our unit on enzymes we do not use the text as support at all and instead select readings from other textbooks. We frequently use the text as support reading in other units and expand through in-class discussions, lab activities, and selected journal articles. We, at best, use a hand-full of the lab activities from the Glencoe series and supplement these with lab activities from a variety of other sources.

>What textbook do you use for AP biology?

We just switched to the Campbell text, most current ed. 8th(?). Previously, we used Starr and Taggart.