

COMPILATION: Pace of course when Modeling Instruction is used

Date: Thu, 3 May 2001
From: David Hestenes <Hestenes@ASU.EDU>
Subject: Pace of modeling instruction/from David Hestenes

Glenn Wagner wrote:

<< Hi David,

<< Glenn Wagner here again. I re-read the Wells paper... Another question: When the agreement was made on the topics to be covered, was the pace of instruction set by Malcolm or one of the other two teachers? I ask this since modeling instruction seems to take a much longer time period than traditional instruction. >>

The pace of modeling instruction varies greatly among our teachers. Some finish mechanics in a semester. Some take two. Malcolm took a semester plus 3 weeks for mechanics.

In our university modeling course, we cover material at the same rate as the traditional lecture-based method. That requires careful organization and planning.

The pace depends critically on the teacher's skill in course management. Most teachers allow a lot of class time to be wasted. What matters most is that the teacher and students are comfortable with the pace. The amount of material covered has no significant effect on student performance in college.

Date: Thu, 3 May 2001
From: David Hestenes <Hestenes@ASU.EDU>

Glenn Wagner wrote:

< Hi David,

It's important that I get this straight: I would think that traditional instruction can proceed at a much faster rate than modeling Instr. since it is teacher centred and the pace is set by the teacher. In modeling we must allow the students time to create the model and in most cases present the model to the class to explain/defend the results. I used to be able to complete the mechanics portion plus light and waves and special relativity. Now I finish the mechanics only (very thoroughly I should add!)

I have to assume then that the traditional instructor has more "wait time" between units so that the modelers can be allowed that extra time to develop and compare models. In the paper it states that "the traditional class had far more conventional problem solving practice" (p. 611). Does this mean

that to fill in the "wait time" (that I think exists) the traditional group were given more problems to solve until everyone was ready to move onto the next unit/model? >

David Hestenes replied:

It only means that that particular instructor put a huge emphasis on problem solving practice.

I am sorry that I do not have time to review the many ways that a modeling teacher can speed up the class pace. **One very important way developed by my grad student Dwain Desbien is called a Board Meeting: All the students gather into a circle where everyone can see all the white boards. The teacher stands outside the circle and only occasionally interjects while the students discuss and compare results. When skillfully done, this is faster and more effective than Socratic questioning.**

Date: Sat, 5 May 2001 1

From: stan hutto <fizwiz2@YAHOO.COM>

I've just read the two recent posts on pacing of the course. First I will assume that the pace set/achieved by Malcolm was in part due to his constant evaluation and study in how to be more effective and thus the beginning of the Modeling Instruction with the tutorage of Dr. Hestenes, et al.

I for one know that yes I do waste time and these are issues that will and are being resolved as I become more adept at the methodology. This year I finished all the Mechanics in one-and-a-half semesters. I was able to do a brief unit on waves and now am completing the unit on electricity. This is the most I have accomplished in three years!

I tried the board meeting method after it was posted last fall and it does speed up the review of lab/worksheet problems - and I did not notice any drop-off in retention or understanding. So I must

assume that sometimes we "beat a dead horse" in the Socratic dialogue and we continue using a lengthy protracted process to far into the year. Next year I will use the lengthier process only for the first two units and then will begin to compact the WB sessions.

Once again my basic mantra is that "Just doin' whiteboards ain't modeling!" It the interactive dialogue that you have the students constantly engage in where they must explain and use the "models" in their questioning/explanations as you interact during class/lab.

Another area that I need to improve on next year is to incorporate more "spiraling" i.e. find/develop problems later in the year that will have the students refer back to the earlier models more consistently than I have been doing.

Final thought. What a wonderful world it would/will be when we get a truly consistent method/ curriculum from elementary to senior year that is based on methods grounded in the studies of Hestenes, Hake, Arons, Redish, and others on how we learn science/math specifically.

Date: Mon, 7 May 2001
From: Eric Brewe [David Hestenes' graduate student, at that time]
Subject: Efficiency and speeding up whiteboard discussion

I have been teaching along with Dwain Desbien and Mike Politano, University Physics at ASU. We have been developing our approach to modeling for a few years now. During that time, we have recognized a variety of things about being certain to cover an appropriate amount during the semester.

There are two facets to speeding up a class, the first being related to **how the board meetings are run.**

The other facet that is important is to **allow work you did at the beginning to pay off in the end.** For example **we spend a long time on kinematics, and much of the time is spent getting students used to the tools that we will be using throughout the year.** We do kinematics with vectors, and as a result when it is time to move on and do force diagrams, we know they already know how to add vectors, so we can concentrate on the concepts involved with force, instead of the practicalities of adding vectors. Furthermore, by the time we get to momentum, we say they are vectors and blow right through it. So time spent at the beginning is often well spent at the end.

These are the things that I think allow us to cover as much if not more during a semester, than a traditional lecture class.