Brainstorm 11/27/2003: The use of Lab Instruments in the VCell

What is the purpose of having lab instruments in the VCell?
- Give students a taste of laboratory procedure and the tools that a biological scientist uses.
- Also because we are being pulled into conforming with current teachings in intro labs.
- I also think that places where schools do not have access to these expensive tools, students can be exposed to them and their purpose
- I think this is a goal but I don’t think it should be a goal, the idea of simulating working in a laboratory.

Constraints:
- The instrument complexity and analysis protocols should not distract from the main goals of VCell which include how to problem solve under the context of Biological Sciences. We all agree on that.

PROS of introducing more complexity in biological protocols
1) Closer to a lab instrument experience for those students not having access to such instruments in certain schools. For students to stay at par with other students, the mere act of thinking out these protocols and the reasoning about the need for the steps involved can be of great benefit to giving concepts another context.
2) Takes away from the magic factor and just handing out of results feeling in the game. Students like to “do” something to collect data. Or at least feel like something is being done to get results increases the immersion factor.

CONS:
1) The complexity of the lab procedure or assay is directly proportional to the boredom factor and distraction factor from the data analysis and problem solving aspects of the game which take the highest priority.
2) There is a limited amount of time in some sense in which we would like the student to make use of the game to learn concepts and problem solving. If each data gathering action required a trip to the lab and even a short protocol, this takes time. Is the time spent worth the returns? Initially perhaps yes, but I argue as the game progresses it is not, especially after the protocol is understood.
3) Most importantly, if each data gathering action required a trip to the lab and some time “t” to complete, in that time, the student might have already been displaced from the problem which he/she was trying to tackle with the results from that analysis. Yes, this is a problem for all of us. In real life, we have to spend lots of time collecting data, and then re-orient ourselves within the big picture to do the analysis. We cant expect the students to do that. That is detracting from the goals of the VCell. And there is not enough time in the game as it is applied now.

You can probably think of many solutions to this but here is mine.
1) The construct is to allow the student to be exposed to a lab protocol but not be required to use it every time.
2) It is weaved into a storyline which does not require “magic answers” at times, i.e. the student isn’t told at some point that “now that you have learned this, you don’t have to come back to the lab each time”.
3) The construct also allows us to require the revisting of the hows and whys of the instrument.
4) Looking to the future it is a nice way to slowly introduce complexity to instruments and protocols amidst a storyline that is somewhat real. Perhaps you are using plastic cuvettes for doing all your spect assays. Now you need to do something with chlorophyll in the UV range. The results come back really strange. A point where you can introduce the use of UV cuvettes in a storyline. The same with any step of a protocol or usage guideline. I think it is a nice way to teach the necessity for those steps/guidelines as well. I have learned repeatedely in the lab from such situations.
Finally, The IDEA:
In this scenario, the students have a hand-held analyzer with them. The function is of this analyzer is to “teleport” the sample collected back to a lab, and send with it a “request” for a particular analysis to be done. Who’s at the lab? The student has “lab assistant” there. However, the first time the student sends a sample back for analysis, the lab assistant replies back that he doesn’t know how to do that, you need to train me. So the student needs to go back to the lab and learn the protocol by reading or any means we choose. And then has to go to a “training the lab assistant in a particular protocol” module where he is told he cannot use any reference materials because you don’t want to show the lab assistant that you don’t know your stuff. Here the student will be given a standard (known result sample) and have to train the assistant by performing an ordering task of all the things that one might do in that protocol. We would have in the selection pool correct and incorrect tasks for each step in the protocol. Now the student, on completing the ordering task (reconstructing the lab protocol for the lab assistant), gives the assistant the standard sample with known result and checks if the lab assistant produces a matching result. If he wasn’t trained properly, the student has to go back to the lab and lookup info on the protocol again, and train again. Once the lab assistant is trained in the particular protocol, the student can return to the field. Every time he sends a sample for that type of analysis the assistant can reply with the request. If we would like the student to review this protocol, the easy storyline is that, that lab assistant was replaced. And of course, the storyline has lots of room to build character around it, and some dialogue and humor etc. This would also allow us to vary the complexity of the protocols depending on college level or highschool or whatever. The more immersive and dialogue rich the environment, the more engaged the student. We want the student to be learning but not even aware of it.