

Lab Usability Report – NABT 2001

At the November 2001 NABT evaluation workshop, we tested three labs with our workshop participant group. There were seven teachers in attendance completing three labs. The teachers were given the student lab and the teacher support materials to read prior to conducting the experiments. All equipment and materials were provided. Al Bodzin, Michelle Heist, Betsy Price, and Robin Heyden were in attendance and made the following observations:

General Suggestions:

- Directions/procedures should be precise but the results shouldn't rely on the precision of the measurements (there should be some wiggle room)
- When asked if they'd prefer to have English equivalents along with the metric units they unilaterally agreed – always metric but English measurements can be nice to have in the teacher's material (parenthetically).
- If you do Take-Home type labs, those measurements should be given in English units
- When asked about the “crying wolf” issue on safety instructions, they said keep doing it. They all ask their students to use goggles with every lab, no matter how mild the reagents and chemicals. They have no problem with “overdoing” the safety instructions/warnings. If you wanted to you could make special note of the REALLY caustic stuff in the teacher materials.
- When we discussed the creation of a database around the labs and by what parameters they would want the labs indexed, they all agreed that “by topic” and “by cost” would be the two most critical and well-used parameters.
- On pre-lab activities – they love the idea although caution us to “not give too much away”. They really liked the pre-lab questions; they make students think more about what's going to happen. If a pre-lab activity doesn't make sense, a post-lab activity is just fine, or no activity.
- When asked about their annual lab budgets, three of the teachers said they could spend what they wanted, within reason. Two claimed a limit of \$1000/year/teacher.
- On the vendor issue, their only concerns about single vendors is if the vendor was a small company and perhaps likely to go out of business. Other than that, they saw no issue with listing materials coming from only one vendor. Where ever possible they encouraged us to go for low cost materials (e.g. they expressed concern about the cost of fast plant seeds). They like to have options for substitute supplies but not so many that it becomes confusing.
- When asked for suggestions on the teacher support material for the labs, they came up with the following suggestions:
 - Provide sample data (to show roughly what the students should come up with)

- Give explanations of what could go wrong
- Provide answers to commonly asked student questions
- Where possible, show a picture of the expected results
- Videos or photographs are handy but only necessary for delicate, non-normal procedures (e.g. the precise spooling technique on the strawberry DNA lab)

Berry Full of DNA

- The lab works beautifully – no procedural suggestions/improvements...”this is great!” “I’m going to try this one when I get back.”
- All agreed this was a great lab and one that they would definitely try with their students (“sure beats cow testes!”)
- Some confusion over the precise spooling technique – they watched each other and got it by following one teacher who knew how to do it (this might be a great opportunity for a short close-up view videoclip)
- Suggested that we not add a part to the lab that suggests students taking home their “spooled” DNA – possible hazard, parent problems.
- Terms that need definition: octoploid
- Questions that kids might have where teachers would like us to provide suggested answers: why is my spooled DNA white and hers pink? Is all that stuff DNA (what else is in there)?
- Suggestion for natural extensions: have kids test other fruit and compare

Is Bile Really Vile

- The experiment worked well – results obtained were solid
- Teachers main concern was over the “down time” – what will the students do for the 30 minutes while waiting for results. All teachers agreed that they would use the warm water bath to speed the reactions; therefore encouraged you to just write that into the procedure. Also, you might want to suggest another, related activity for them to do while they’re waiting for results.
- Their other observation was that they probably wouldn’t do this lab – mostly because they don’t do a digestion lab currently. A&P is not a big part of these teachers’ curriculum and, if they do cover the topic, it’s not important enough for them to do a whole lab on it. So, in general, they were less enthused about this lab.
- On the data chart, one teacher suggested that we record the data by time interval – one data point every 5 minutes for 30 minutes. Unless you specify a time period, the students will be very sporadic about it and might miss the color change.
- Related to that point, one teacher suspected that students will look for a more dramatic color change – since the reaction with test tube #3 (pancreatic juice + bile) happens very quickly, they might miss it. Perhaps

have a color photograph in the teacher support material showing the various color endpoints so that at least the teacher knows what to expect. Then the teacher can decide how to talk to the students about expected color changes.

- One teacher said that her students (particularly the boys) would have trouble coming up with the vocabulary to describe such subtle changes in color (e.g. “light pink”, “salmon”, “peachy”).
- Teachers agreed that we should consider making the fourth test tube the one that contains both pancreatic juice + bile in order to make sure that the students won’t miss the reaction (as that’s the last one they prepare).
- They all liked very much the idea that the student should figure out the appropriate contents of one of the test tubes.
- Make sure the enzyme information to support this lab can be found in the EL textbook
- Some teachers wondered why we were using milk in the experiment. Since milk has protein, doesn’t that just confuse the experiment by introducing another variable? Wondered if they could do it with vegetable oil (something closer to pure fat)?
- Expressed concern over getting the pH of the milk right prior to the lab – want to be sure they have good support for that in the teacher support materials.
- Questions that kids might have where teachers would like us to provide suggested answers: why milk? How did you get ahold of pancreatic juice and bile?
- Suggestion for an extension: have students graph their results with a color chart for pH.

Design a Cell

- The teachers really liked this one. “Cool!” “I’m going to try this!” “Much better with the phenolphthalein in the agar so that the color goes from pink to clear”
- They all liked the balloon cell demo and suggested possibly expanding it by putting a small battery in the balloon to represent the mitochondria.
- Suggestion for the teacher support material: remind the teacher to use the cheapo agar for this lab and not the “good stuff” and caution the teacher to remind the students to use weighing boats or a tray (along with a tare weight) when weighing their cells
- This is a nice, simple lab – easy to do and makes an excellent point.