Letters

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A Proposal for Uniform Symbols for Codominance

Textbooks are using a variety of symbols for expressing codominance or lack of dominance among alleles. One of the most common and yet inconsistent ways is to use the same upper case/lower case system as in a regular dominant/recessive pair, e.g. RR = Red, Rr = Pink, and rr = white. Students are told that this is an example of codominance in which the heterozygous genotype results in a phenotype that is a blend of the two codominant traits. This is inconsistent and confusing.

Although the most recent edition of *BSCS Biology . . . An Ecological Approach* (Cairney 1998) still does not use any symbols for codominance, see pp. 175–176. On page 176, the authors use the system that many of us use for blood types, i.e. superscripts on a base for multiple alleles that show codominance, e.g. I^A = gene A; I^B = gene B.

This is so sensible I propose that for all codominant situations a capital letter (base) be used to designate the trait and a capital letter designating the specific alleles be shown as a superscript.

For example, in four o'clocks, flower color is a codominant feature. Use the following symbols:

> C = color. C^R = Red; C^W = White. A red flower would be $C^R C^R$, a pink flower would be C^RC^W, and a white flower would be $C^W C^W$.

There is an apparent inconsistency when using this "new" system and then later discussing X-linked traits. Here the basic letters X and Y are chromosomes, not genes. Since chromosomes, not genes, are involved, there should be no problem. I have tried this in my own classes where it is quite successful. Try this in your own classes. Good luck. I would like to thank my Biology colleagues here at Highland Park High School for their review of this idea.

References

Cairney, W.J., et al. (1998). *BSCS Biology . . . An Ecological Approach.* Dubuque: Kendall/Hunt Publishing Company.

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When the Mice Die . . .

Dear Editor:

Murray Jensen and Mike Smith make interesting observations regarding the importance of scientific and academic honesty in their article, "What To Do When Mice Die," (Murray & Smith 1999). They discuss problems with laboratory preparation that have led to improper representation of scientific concepts in laboratory experiences. One describes a deliberate mislabeling of mice supposedly treated with hormones; the second discusses improper vial stocking of *Drosophila* to properly predict Medelian inheritance. Both note the inappropriateness of their actions but appear to dismiss the significance. Surely scientific misconduct such as forging or "making up" data would be intolerable by *any* researching standard. Phony data passed off as legitimate would undermine the basic tenant of truth and understanding of science. False data or data collection methods, therefore, are unacceptable in the science classroom under any and all circumstances.

We, as science educators and leaders, must not fall prey to allowing poorly designed laboratories, or laboratories that consistently generate erroneous data to be part of our curriculum. I offer the following two suggestions:

1. ONLY use labs that work.

This may seem obvious, but if we choose to use unreliable labs, our students receive a disservice. We need to teach the value of trusting and understanding data. There should be no need for a teacher to pontificate *expected* lab results because a lab does not produce the *desired* results. A lab should generate its own proper conclusions. We need not blame students for bad technique, because they are the learners. Students need to focus both on the nature of science and learning laboratory technique. Labs should be forgiving and allow for both standard experimental error and student-introduced error.

For example, my colleagues and I have found that the Advanced Placement Required Laboratory #2, Enzyme Catalysis (College Board 1997) has rarely produced consistent data. The laboratory requires a potassium permanganate titration of a hydrogen peroxide solution treated with catalase. The catalase catalyzes a dissociation reaction changing peroxide into oxygen gas and water. The titration measures the amount of peroxide remaining. Rather than repeatedly using a poor lab, we have chosen to use an alternate lab based on BSCS Blue, which measures oxygen evolved (Winternitz & Cairney 1996). Students can easily manipulate variables and produce consistent reproducible results. Students can draw valid conclusions based on their data. They do not need to infer what was "supposed" to happen, because data is true to form.

2. ALWAYS collect class data.

When conducting student experiments in a high school laboratory situation, individual lab groups often make mistakes, which in an isolated situation, contribute to extensive experimental error. In order to minimize such error, teachers should use class data. Theoretically, the more data points and trials, the more the observed results will approach the theoretical (Yates et al. 1999). In the case that an individual lab group collects erroneous data during the experiment, it will be averaged out by other groups. Replicates are commonplace in the research laboratory. However, time constraints often prevent replicates in a classroom setting. Compiling class data, in essence, provides the necessary additional data.

I once thought that this was a time-consuming task, but I have modified the method by using a computer. Students collect data and enter it into a spreadsheet on one central computer in the room. Multiple computers are not necessary and actually become more cumbersome and inconvenient. (i.e. different data will be located in different computers). After data entry, students take the information to analyze for themselves. Some take printouts, others copy the file to disk, while others e-mail the file to themselves. Students can calculate averages, sums, standard deviation, and other statistical modeling with several keystrokes.

We do not use scientific software for data analysis, but rather current business software packages. Through analyzing data, students receive practical experience using professional spreadsheet software. This knowledge is applicable to many non-scientific fields as well. Students gain an understanding of the power of computer software to tackle specific tasks.

The initial investment in time to train students to use spreadsheets repays itself throughout the year as students follow a regular prescribed method for data collection and analysis.

Our students deserve to have the best possible experience in their science classes. Engaging in reliable laboratory activities is a necessity.

References

College Board. (1997). *Advanced Placement Biology Laboratory Manual for Students; Exercises 1–12. Edition D.* New York: College Board.

Jensen, M. & Smith, M. (1999). What to do when the mice die. *The American Biology Teacher, 61*(9), 655–661.

Winternitz, K.A. & Cairney, W.J. (1996). *Biological Science: A Molecular Approach.* Lexington, KY: DC Heath and Company.

Yates, D., Moore, D. & McCabe, G. (1999). *The Practice of Statistics.* New York: W.H. Freeman and Company.

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Author's Response

We would like to thank Frank LaBanka for his thoughtful response to our article, "What To Do When the Mice Die." Generally, we find his views consistent with our own.

LaBanka's first suggestion is to "only use labs that work." Too often, teachers continue to use labs that produce inconsistent results or are otherwise unacceptable rather than expend